JVC

SERVICE MANUAL

COLOUR VIDEO CASSETTE RECORDER VHS

MODEL HR-D120E/EG

SPECIFICATIONS

Format	: VHS PAL standard
Recording system	: Rotary, slant azimuth two-head helical scan system
Video signal system	: PAL colour and CCIR monochrome signal, 625 lines
Tape width	: 12.65 mm
Playing time	: 240 minutes with E-240 video cassette
Temperature	
Operating	: 5°C to 40°C
Storage	: -20°C to 60°C
Channel coverage	: VHF BAND I, channels 2 – 4, VHF BAND III, channels 5 – 12, UHF BAND IV/V, channels 21 – 69
Aerial output	: UHF channels 32 – 40 (adjustable)
Power consumption	: 30 watts
Power requirement	: 220 V~, 50/60 Hz
Video	
Input	: 0.5 to 2.0 Vp-p, 75 ohms unbalanced
Output	: 1.0 Vp-p, 75 ohms unbalanced
Signal-to-noise ratio	: More than 43 dB (Rohde & Schwarz noise meter) with PICTURE SHARPNESS control at centre position
Horizontal resolution	: 250 lines with PICTURE SHARPNESS control at centre position
Audio	
Input	: Line: -20 dBs 50 k-ohms unbalanced
Output level	: -6 dBs, high impedance load
Output impedance	: 1 k-ohm, unbalanced
Signal-to-noise ratio	: More than 40 dB
Frequency range	: 70 Hz to 10,000 Hz
Timer	: 14-day/1-programme timer
Dimensions	: 435 mm(W) x 130mm(H) x 368 mm(D)
Weight	: 9 kg
Provided accessories	: Aerial cable, Video cassette tape, Infrared remote control unit RM-P12E, "R6" battery x 2

Design and specifications subject to change without notice.

No. 8305
June 1983

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Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.

2. Parts identified by the ⚠ symbol and shaded (■) parts are critical for safety.
   Replace only with specified part numbers.
   Note: Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.

3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads

4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors

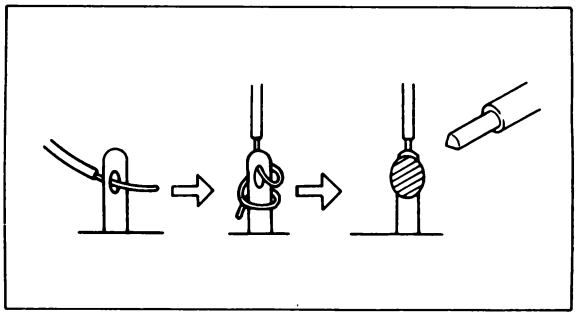

Fig. 1

5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)

7. Check that replaced wires do not contact sharp edged or pointed parts.

8. When a power cord has been replaced, check that 10–15 kg of force in any direction will not loosen it.

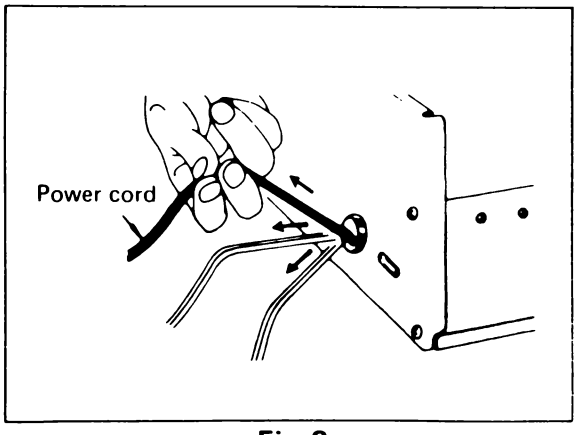

Fig. 2

9. Also check areas surrounding repaired locations.

10. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the parts specified. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.

11. Crimp type wire connector

In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.

1. Connector part number : E03830-001
2. Required tool : Connector crimping tool of the proper type which will not damage insulated parts.
3. Replacement procedure

   1) Remove the old connector by cutting the wires at a point close to the connector.
   Important : Do not reuse a connector (discard it).
   2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.
   3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.
   4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.
   5) Check the four points noted in Fig. 7.

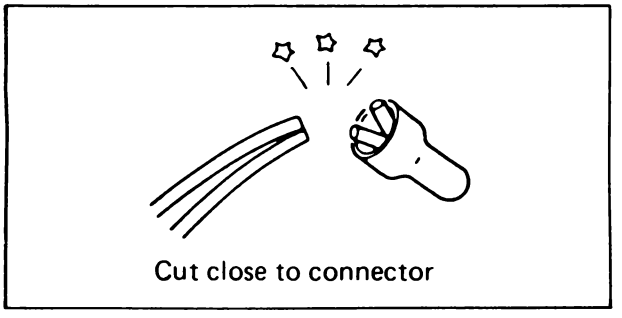

Fig. 3

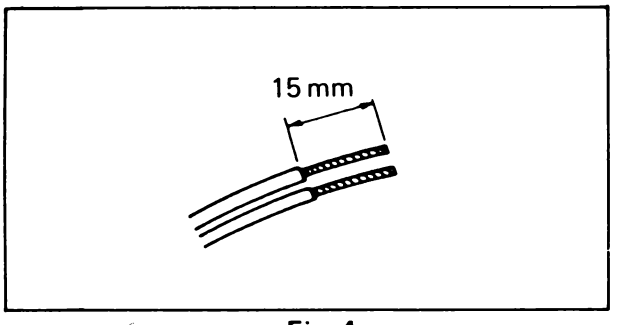

Fig. 4

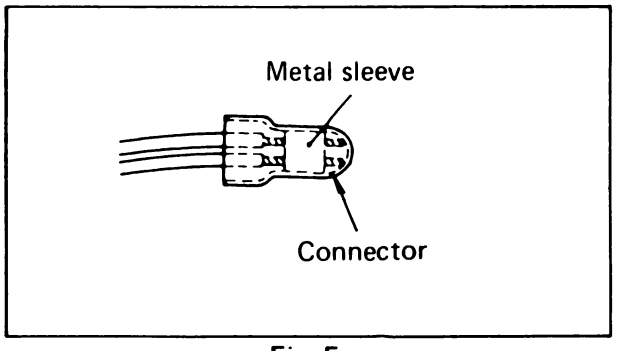

Fig. 5

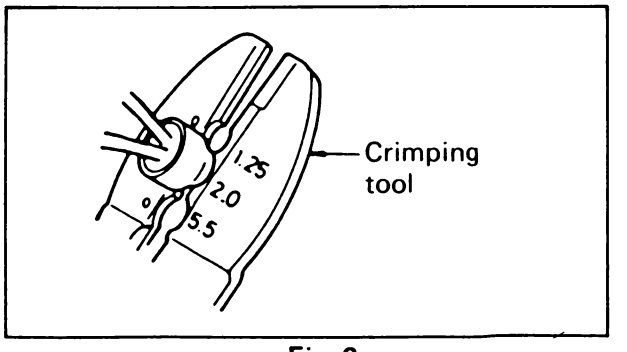

Fig. 6

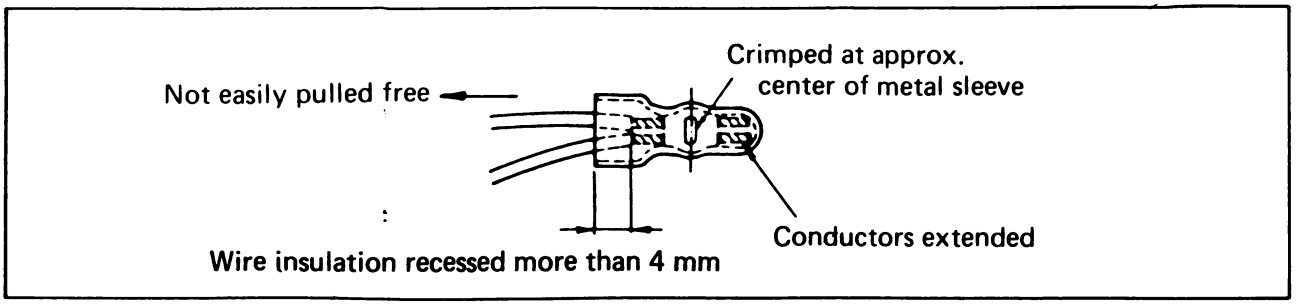
Crimped at approx. center of metal sleeve
Not easily pulled free
Conductors extended
Wire insulation recessed more than 4 mm

Fig. 7

● Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions. Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. Insulation resistance test

Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

2. Dielectric strength test

Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.) See table below.

3. Clearance distance

When replacing primary circuit components, confirm specified clearance distance (d),(d') between soldered terminals, and between terminals and surrounding metallic parts. See table below.

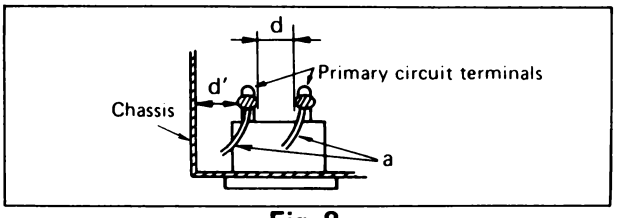

Fig. 8

Table 1: Ratings for selected areas

AC Line Voltage	Region	Insulation Resistance	Dielectric Strength	Clearance Distance(d),(d')
100 V	Japan	≧ 1 MΩ/500 V DC	1 kV 1 minute	≧ 3 mm
110 to 130 V	USA & Canada	– – –	900 V 1 minute	≧ 3.2 mm
* 110 to 130 V 200 to 240 V	Europe Australia	≧ 10 MΩ/500 V DC	4 kV 1 minute	≧ 6 mm (d) ≧ 8 mm (d') (a: Power cord)

* Class Π model only.

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

4. Leakage current test

Confirm specified or lower leakage current between B(earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).

Measuring Method: (Power ON)
Insert load Z between B(earth ground,power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure and following table.

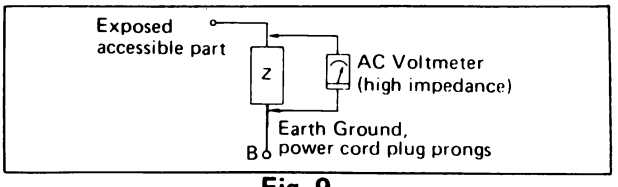

Fig. 9

Table 2: Leakage current ratings for selected areas

AC Line Voltage	Region	Load Z	Leakage Current (i)	Earth Ground (B) to:
100 V	Japan	1 kΩ	i ≦ 1m A rms	Exposed accessible parts
110 to 130 V	USA & Canada	0.15 μF, 1.5 kΩ	i ≦ 0.5m A rms	Exposed accessible parts
110 to 130 V 200 to 240 V	Europe Australia	2 kΩ	i ≦ 0.7 m A peak i ≦ 2 m A dc	Antenna earth terminals
		50 kΩ	i ≦ 0.7 m A peak i ≦ 2 m A dc	Other terminals

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

INSTRUCTIONS

WARNING

1. This set is for exclusive use with the PAL colour system (system B and G).
2. SECAM (system B and G) colour programmes might be recorded in certain areas but there is no interchangeability of these recorded cassette tapes with other PAL-VHS recorders or SECAM-VHS recorders.
3. Please use the exclusive SECAM-VHS recorder in SECAM broadcasting areas.
4. Please use only PAL prerecorded cassette tapes or PAL signals which have been recorded with the PAL-VHS system.
5. For camera recording, connect a video camera built to the PAL standard.

IMPORTANT: It is permissible to record television programmes only in the event that third party copyrights and other rights are not violated.

Only cassettes marked "VHS" can be used with this video cassette recorder.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

CAUTION
Dangerous voltage inside. Refer internal servicing to qualified service personnel. To prevent electric shock or fire hazard, remove the power cord from the AC outlet prior to connecting or disconnecting any signal lead or aerial.

MAINS POWER SWITCH
The mains switch is located on the rear connector panel. Setting this switch to OFF removes all applied power from the set including the timer clock. Switching on or off the recorder section is performed with the secondary power switch, labelled OPERATE, on the front panel.

NOTE: The rating plate and the safety caution are on the rear of the unit.

CAUTION: When you are not using the HR-D120E for a long period of time, it is recommended that you disconnect the power cord from AC outlet.

Thank you for purchasing the JVC HR-D120E Colour Video Cassette Recorder. This unit is based on the VHS system developed by JVC for full home video entertainment. Its most important feature is the symbolic operation buttons; with microprocessor control, these make operation easy enough for practically any member of the family. With the HR-D120E you can record a TV programme while you are watching it, record one programme while watching another and, with the 14-day timer, record programmes when you are not at home.

Before using this video recorder, read this instruction booklet carefully so that you will obtain best results from your HR-D120E.

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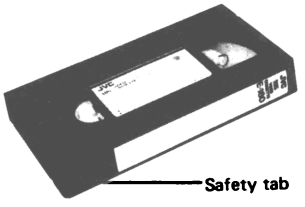
PRECAUTIONS

Handling and storage

- Avoid using the recorder under the following conditions:
  - extremely hot, cold or humid places,
  - dusty places,
  - near appliances generating strong magnetic fields,
  - places subject to vibrations, and
  - poorly ventilated places.
- Be careful of moisture condensation.
  Avoid using the recorder immediately after moving from a cold place to a warm place or soon after heating a room which was cold. The water vapor in warm air will condense on the still-cold video head drum and tape guides and may cause damage to the tape and the recorder.
- Handle the recorder carefully.
  - Do not block the ventilation openings.
  - Do not place anything heavy on the recorder.
  - Do not place anything which might spill and cause trouble on the top cover of the recorder.
  - Use in horizontal (flat) position only.
- In case of transportation,
  - Avoid violent shocks to the recorder during packing and transportation.
  - Before packing, be sure to remove the cassette from the recorder.

Video cassettes

- This recorder employs VHS-type cassettes only.
  E-240 for 4 hours, E-180 for 3 hours, E-120 for 2 hours, E-60 for 1 hour and E-30 for 30 minutes of recording.
- Video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has already been removed, use adhesive tape to block the hole.



- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid extreme humidity, violent vibrations or shocks strong magnetic fields (near a motor, transformer or magnet) and dusty places.
- Place the cassettes in cassette cases and position vertically.

Moisture condensation

- If you pour a cold liquid into a glass, water vapor in the air will condense on the surface of the glass. This is called moisture condensation.
- Moisture condensation on the head drum, one of the most crucial parts of the video recorder, will cause damage to the tape.
- Moisture in the air will condense on the recorder when you move it from a cold place to a warm place, after heating a cold room or under extremely humid conditions.
- This recorder is equipped with a moisture condensation prevention circuit which automatically heats the head drum according to the ambient temperature. This circuit operates only when the unit is plugged into an AC outlet, the rear panel MAINS POWER switch is set to ON and the front panel OPERATE button is in the OFF position.
- The moisture condensation prevention circuit consumes only a slight amount of power. However, if for some reason you are not using the recorder for a long period of time, it is advisable to remove the power cord from the AC outlet or set the rear panel MAINS POWER switch to OFF.
- Since the moisture condensation prevention circuit cannot evaporate existing moisture condensation immediately after the power cord has been plugged into the AC outlet, you must allow for about 2 hours if the recorder is to be used in such areas as would occasion moisture condensation.

Operation

- The cassette can be loaded only when the recorder is powered (with the front panel OPERATE button in the ON position). Do not force the cassette into the slot with the power off.
- When the rear panel MAINS POWER switch is set to ON after it has been set to OFF once, the recorder section cannot be powered even though the front panel OPERATE button has remained in the ON position. In such a case, first press the OPERATE button to OFF and then press it to ON.
- If you wish to operate the recorder locally after you have switched the power off via the remote control unit, first press the OPERATE button to OFF and then press it to ON again.
- As long as the OPERATE button is in the ON position, switching the recorder on or off can be performed via the remote control unit.

Remote control unit RM-P12E

- Avoid violent shocks, especially take care not to drop the unit.
- Take care not to allow liquid to spill into the unit.
- Do not place heavy objects on the unit.
- Avoid leaving the unit in places subject to direct sunlight or extremely high temperatures.

FEATURES

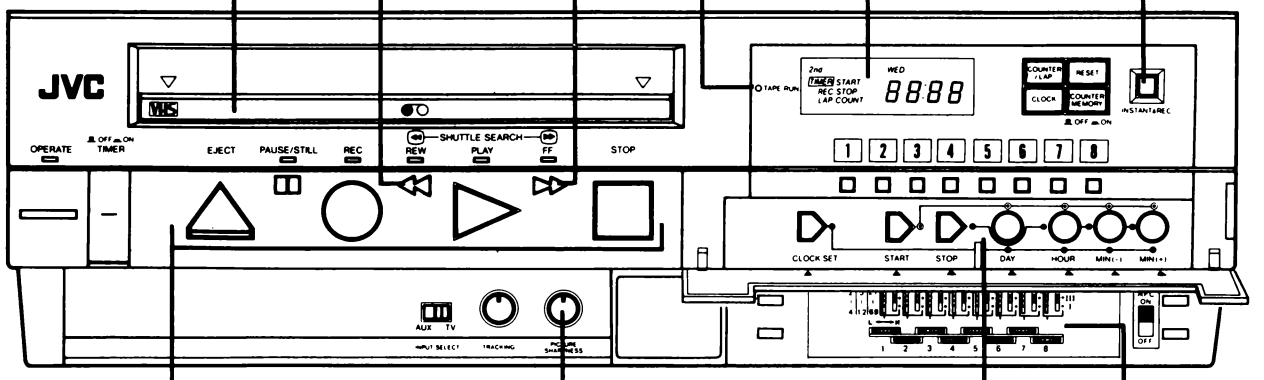
Motorised front-loading system
The cassette loading slot is equipped with two separate door flaps; for easy identification of the presence of a cassette inside, the color of the lower flap is changed when the cassette is inserted.

Shuttle search for quick programme location
Approximately 9 times normal speed in either direction.

Comprehensive fluorescent tube display
Switchable among clock, tape counter, elapsed time counter and programmed timer recording data display.

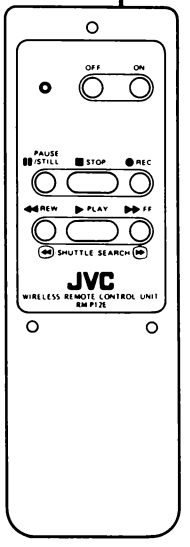
Instant recording facility
Simple, one-touch recording function for up to 4 hours of recording.

Tape-run indicator



Easy operation with big, symbolic operation buttons

Full-function infrared remote control unit RM-P12E



Picture sharpness control
Sharper or softer pictures according to your preference.

Easy-to-set 14-day timer
Colour-coded buttons for making it easy to set for unattended recording. Serial recording of regularly broadcast programmes is also possible.

VHF/UHF 8-channel electronic tuner

- **Auto rewind at tape end**
- **Automatic release mechanism**
  Protects tape by releasing Pause/Still mode after 5 minutes.
- **Brushless, quartz-locked, direct-drive drum motor**
  For greater reliability, plus independent capstan, tape loading and cassette loading motors.

CONTROLS AND CONNECTORS

Front panel

REW/SHUTTLE SEARCH button
To rewind the tape, press this button while in the Stop mode. To view the speeded-up picture in the reverse direction for programme search, press this button while in the Play mode.

FF/SHUTTLE SEARCH button
To fast forward the tape, press this button while in the Stop mode. To view the speeded-up picture in the forward direction for programme search, press this button while in the Play mode.

OPERATE button
Press to apply power to the HR-D120E for recording or playback. The OPERATE indicator will light.

PLAY button
Press to play back the tape or release the Shuttle Search or Pause/Still mode.
Also, press this button together with the REC button to record.

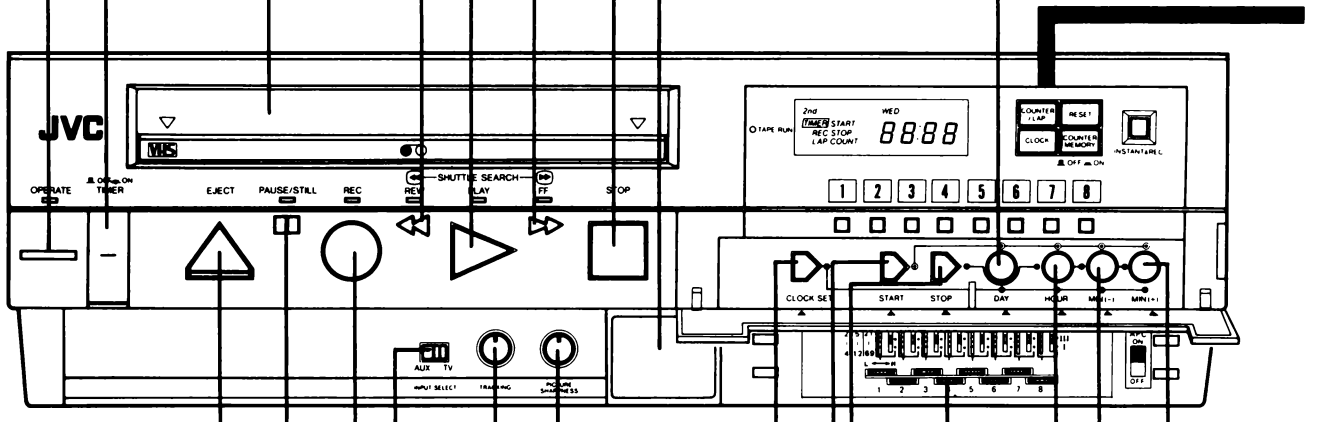
STOP button

TIMER button
Press to ON (⁃) after you have preset the recorder for unattended timer recording.

DAY button
Press until a desired day indication appears on the display for CLOCK and TIMER settings.

Cassette loading slot

Infrared beam receiving window



EJECT button

PAUSE/STILL button
Press to stop the tape temporarily to avoid recording of unwanted material. When this button is pressed during playback, a still picture will appear.
The still picture can be advanced in a frame-by-frame manner each time this button is pressed.

REC button

INPUT SELECT switch (AUX/TV)
Set to AUX when you are recording with a video camera or from other video sources. Set to TV for taping off-air TV programmes.

PICTURE SHARPNESS control
Turn this knob clockwise to make the picture sharper. Turn counterclockwise to give the picture a softer tone.

TRACKING control
Turn to minimise noise bars, if observed, during normal-speed playback.

CLOCK SET button
Hold this button pressed for clock setting. Use the DAY, HOUR, MIN (+) and MIN (-) buttons to set the time and day.

START button
Press for setting the day and switch-on time for automatic timer recording.

Pre-tuning section

MIN (+) button
Press to increase the minute indication for CLOCK and TIMER settings.

MIN (-) button
Press to decrease the minute indication for CLOCK and TIMER settings.

HOUR button
Press to obtain the required hour indication for CLOCK and TIMER settings.

STOP button
Press for setting the switch-off time for automatic timer recording.

TAPE RUN indicator
Blinks according to the supply reel speed, showing the condition of tape running.

Week indicator
"2nd" will be illuminated when the timer is set for recording to start on a day in the second week from setting.

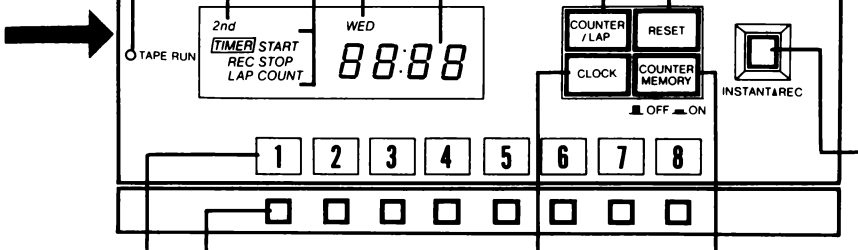
Display mode indicators

TIMER:	Illuminates when the TIMER button is in the ON position.
START:	Flashes for switch-on time setting.
STOP:	Flashes for switch-off time setting.
REC STOP:	Flashes or lights during instant recording.
LAP:	Lights when the Lap mode is engaged.
COUNT:	Lights when the Counter mode is engaged.

Clock/Counter/Lap/Timer display

Clock:	24-hour time indication
Counter:	4-digit tape counter
Lap:	elapsed recording time in hours and minutes
Timer:	programmed timer recording data

Day indicator



COUNTER/LAP button
Press this button to change the display to the Counter or Lap mode. (See page 16.)

Counter/Lap RESET button

INSTANT REC button
Use this button to start recording instantly and stop automatically after a specific time. (See page 19.)

COUNTER MEMORY button
When this button is pressed to ON (▂), the tape will stop automatically at the counter reading of about "0000" in the Rewind or Fast Forward mode.

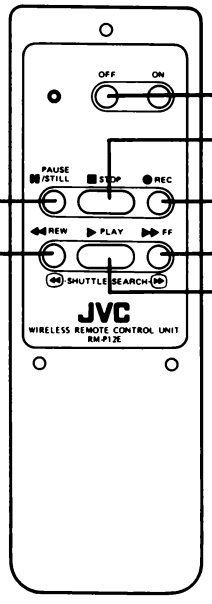
Channel select buttons

Channel indicators

CLOCK button
Press this button to change the display to the Clock mode. (See page 16.)

Infrared remote control unit RM-P12E

The infrared remote control unit gives you full operation control from your viewing position. All control buttons have the same function as the corresponding buttons on the recorder.



ON/OFF buttons
To switch recorder power on or off.

STOP button

REC button

FF/SHUTTLE SEARCH button

PLAY button

PAUSE/STILL button

REW/SHUTTLE SEARCH button

Rear panel

MAINS POWER switch
Switching ON applies power to the unit. To switch off the unit completely, set the MAINS POWER switch to OFF. This switches off the timer clock and cancels all preset data. This also switches off the built-in aerial circuit so that the TV receiver connected to the HR-D120E will not be able to receive off-air TV programmes for good viewing condition. Normally set this MAINS POWER switch to ON.

ANT IN terminal
Connect a TV aerial to this connector.

Video mode select switch
This applies to both recording and playback.

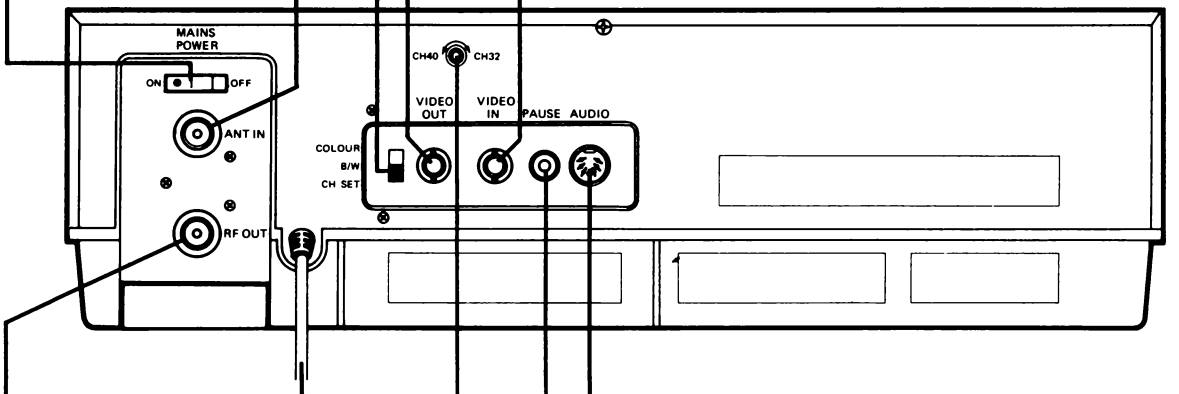
COLOUR: Set to this position when the input or playback video signal is in colour.

B/W: Set to this position when the input or playback video signal is monochrome.

CH SET: Set to this position when tuning your TV receiver for the "VIDEO CHANNEL".

VIDEO OUT terminal
Connect to the VIDEO IN terminal of another video recorder for tape-to-tape transfer, or the VIDEO IN terminal of a video monitor for playback.

VIDEO IN terminal
Connect to the VIDEO OUT terminal of another video recorder for tape-to-tape transfer, or the VIDEO OUT terminal of the camera adapter for camera recording.



AC power cord
Connect to a 220 V~, 50/60 Hz AC outlet.

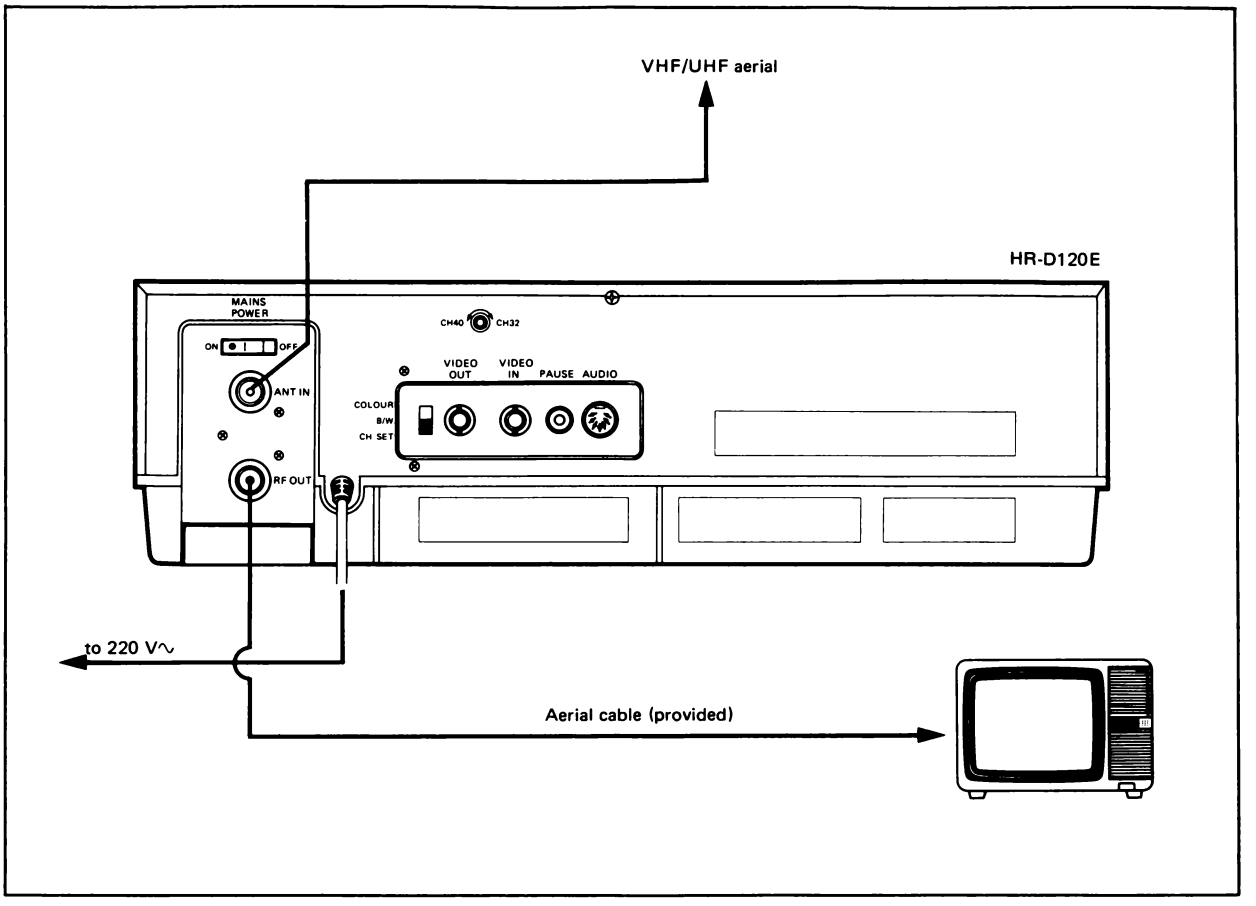
RF OUT connector
Connect to the aerial terminal of a TV receiver with the aerial cable (provided).

Remote PAUSE terminal
When using a video camera, connect the remote control plug of the camera adapter to this terminal.

AUDIO In/Out DIN socket
Connect a tape recorder or other audio sources or connect the audio output of a video camera (through an appropriate adapter) for recording. Also audio signals being recorded or played back are available from the output terminals of this DIN socket. The socket is of the 7-pin configuration, but 5-pin DIN connectors can also be plugged in.

RF converter frequency adjustment screw
(See page 9.)

CONNECTIONS



Procedure

- Remove the aerial cable from the TV receiver and reconnect to the HR-D120E as illustrated. The HR-D120E is then ready to record off-air programmes.
- Connect the HR-D120E to the TV receiver using the aerial cable (provided) as illustrated. The TV receiver is then ready to receive TV broadcast programmes as well as accommodate video cassette playback.

Note:

Even when you are not using the HR-D120E, the rear panel MAINS POWER switch should be set to ON in order to be able to view TV broadcasts with this connection.

For reference

- Previously, when you were using only the TV receiver, broadcast signals went to the TV receiver directly from the aerial.
  Now, after you have connected the HR-D120E to the TV receiver, broadcast signals enter the HR-D120E directly from the aerial (to be received by the built-in tuner for recording onto the cassette tape) and go to the TV receiver through the HR-D120E (to be received by the TV receiver's tuner for ordinary viewing).
- In order to transmit entering broadcast signals to the TV receiver, an aerial circuit is built into the HR-D120E. This aerial circuit must function as long as you are viewing TV programmes even though you are not using the HR-D120E. If the rear panel MAINS POWER switch is set to OFF, the HR-D120E's aerial circuit is also switched off. In this state, the connected TV receiver cannot properly receive off-air TV programmes for good viewing condition. Therefore, normally, keep the rear panel MAINS POWER switch set to ON.

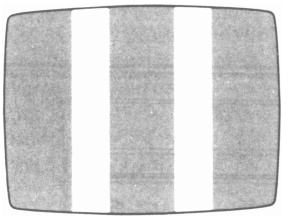
VIDEO CHANNEL SETTING

The built-in RF converter permits playback of video and audio recordings through a TV receiver. The signals from the RF converter are viewed through a vacant channel not used for broadcasting in your viewing area.

The converter channel of all units is set to UHF channel 36 prior to shipment. Setting your TV receiver to UHF channel 36 may provide video playback. However, to obtain the best possible reproduction on your TV receiver, accurate adjustment to the RF converter output is required.

Procedure

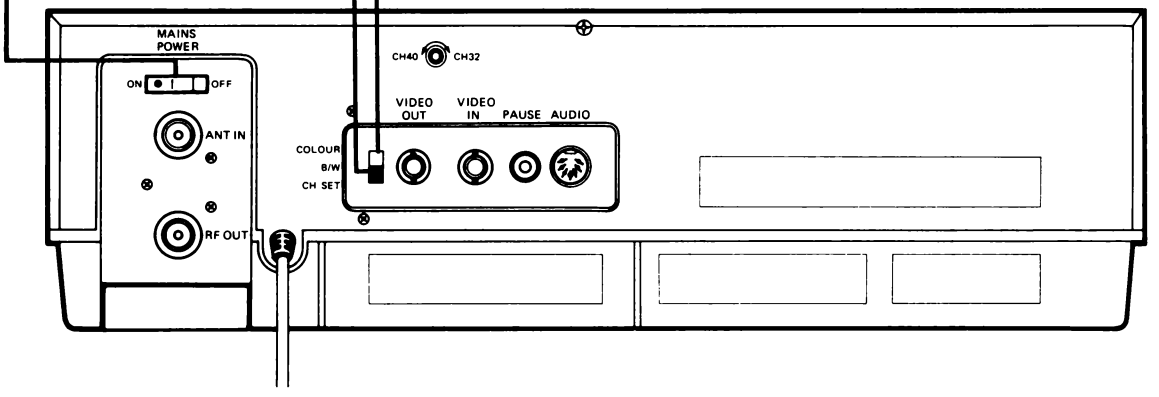
1 Set the rear panel MAINS POWER switch to ON and press the front panel OPERATE button to ON. Turn on the TV receiver.



3 Adjust your TV receiver in the vicinity of UHF channel 36 until you bring in the two white signal bars on the screen as illustrated.
This setting is now the VIDEO CHANNEL of the TV receiver to which the HR-D120E is connected.

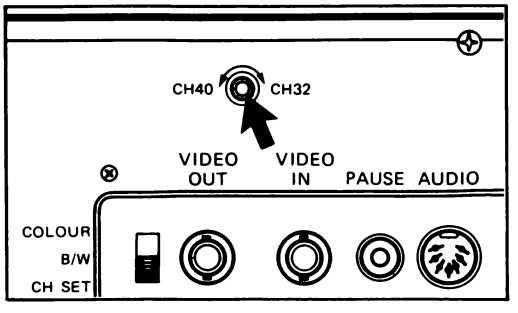
2 Set the video mode switch, located on the rear panel, to CH SET (Channel Setting).

4 Reset the video mode switch to COLOUR.



Notes:

- When you adjust your TV receiver to channel 36 for video playback, if some interference noise is seen on the screen because of broadcasts on neighbouring channels or if your preset broadcasts should be affected in picture quality, it is necessary to adjust more accurately the RF converter output.



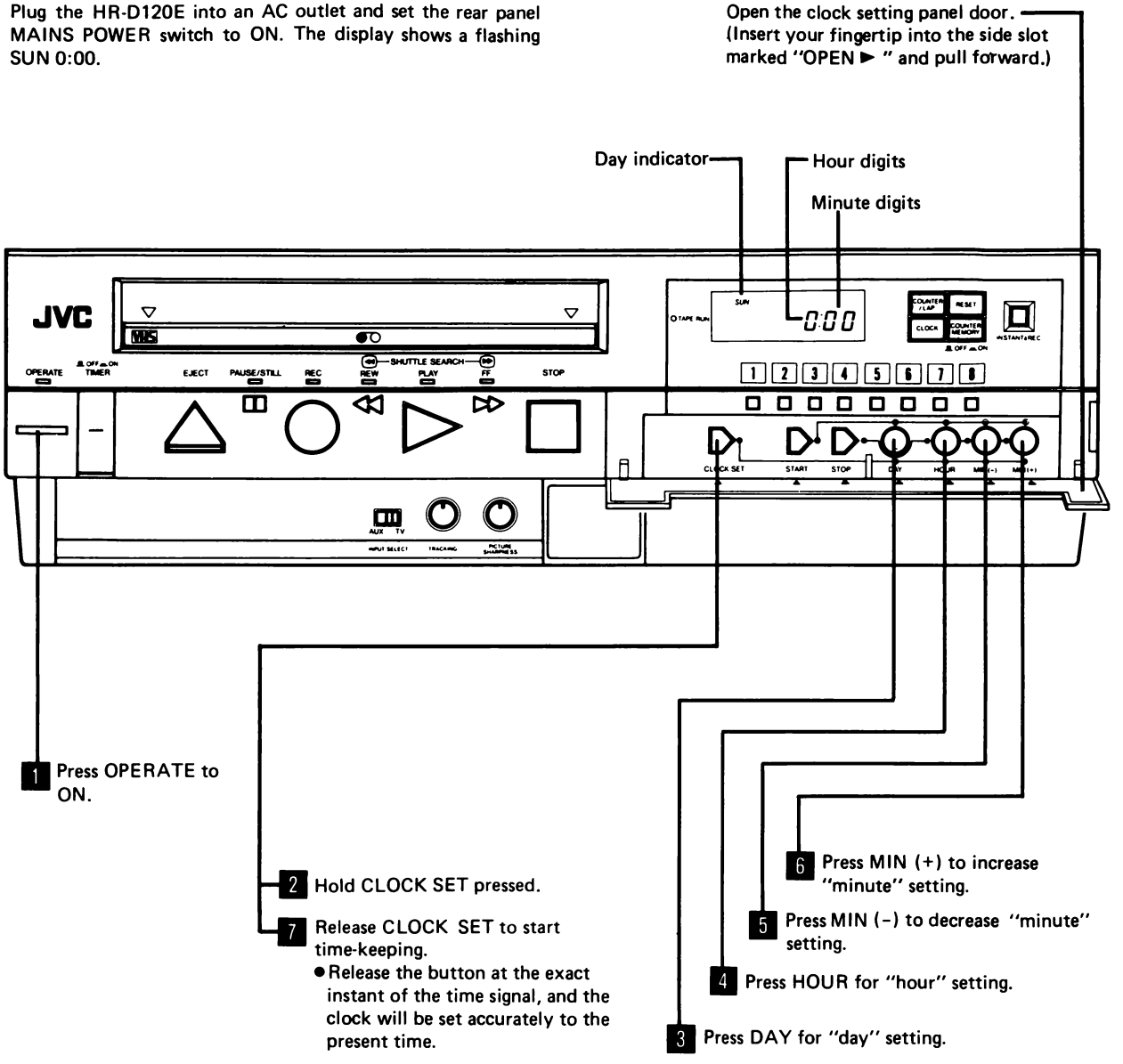
For this purpose, insert a screwdriver into a hole provided on the rear of the set and re-adjust the RF converter frequency adjustment screw in minute steps. Then tune the TV receiver once again until a clear picture is obtained.
This adjustment requires extreme precision and must be done with the utmost care. We recommend that you consult your JVC dealer for making this adjustment.

- Be sure to set the video mode switch to COLOUR after VIDEO CHANNEL tuning has been completed.
- No signal is available from the VIDEO OUT terminal while the Channel Setting signal is being used.
- If a prerecorded VHS cassette is available, TV adjustment for VIDEO CHANNEL setting is also possible using it to obtain a playback picture. Insert the cassette and operate the HR-D120E for playing back the cassette. Then tune the TV receiver to obtain clear pictures and sound while monitoring the playback picture on the TV screen.
- If your TV receiver is not provided with an AFC circuit, perform fine tuning of the TV receiver when you are actually viewing video cassettes.

CLOCK SETTING

Plug the HR-D120E into an AC outlet and set the rear panel MAINS POWER switch to ON. The display shows a flashing SUN 0:00.

Open the clock setting panel door. (Insert your fingertip into the side slot marked "OPEN ► " and pull forward.)

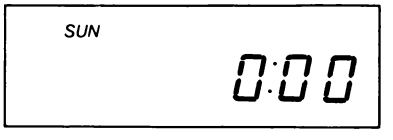


Note

- Holding the DAY, HOUR, MIN (+) and MIN (-) buttons pressed continuously advances the corresponding indication automatically. Pressing either of them once advances the indication in single increments only.

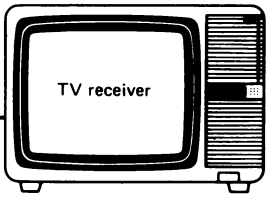
Power failure indicator

The entire clock display may start to flicker fast. This is not a malfunctioning of the clock, but it indicates that there has been a power failure. Re-adjusting the time restores the normal condition of the clock display.



BUILT-IN TUNER PRE-TUNING

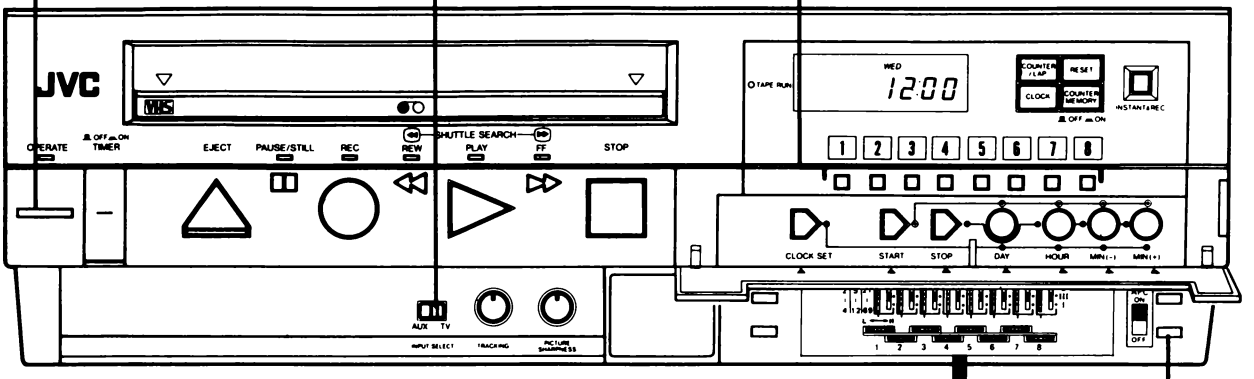
2 Switch ON.
- Adjust the TV receiver's channel to your video channel.



6 Press the channel select button which you've chosen to allocate for the station to be pre-tuned in. The channel number corresponding to the selected channel will be illuminated.

1 Press OPERATE to ON.

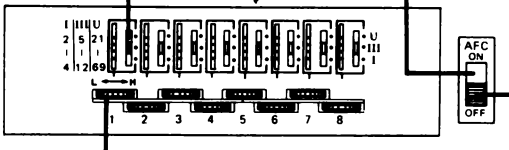
3 Set to TV.



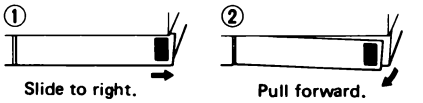
7 Set the VHF/UHF band selector as required.
Set to I when tuning in to VHF channels 2 through 4.
Set to III when tuning in to VHF channels 5 through 12.
Set to U when tuning in to UHF channels 21 through 69.

10 Set AFC to ON.

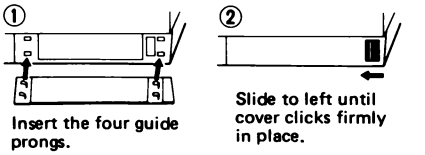
5 Set AFC to OFF.



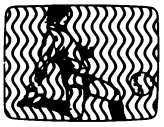
4 Remove the pre-tuning control compartment cover.



11 After completing pre-tuning for all channels, replace the cover.



9 **FINE ADJUSTMENT**
To obtain the best possible picture, first turn the tuning control until you get a striped picture, and then slowly turn, little by little, to clear up the picture.


Striped picture

Clear picture with colour

8 Turn the tuning control corresponding to the selected channel while observing the TV screen until a desired station is tuned in.
- Turning the tuning control in either direction moves the pretuning indicator.

Notes
- Repeat steps 6 through 9 before step 10 for each channel you wish to pre-tune.
- Check all the pre-tuned channels after switching the AFC switch to ON, and, if a clear picture or correct colour is not obtained, re-perform tuning in the manner described above.
- If the picture is still not clear, perform the fine tuning adjustment on the TV receiver.
- Distorted pictures or sound will be recorded if fine tuning has not been properly performed. Exercise care with this adjustment since the recorded picture and sound cannot be adjusted later.

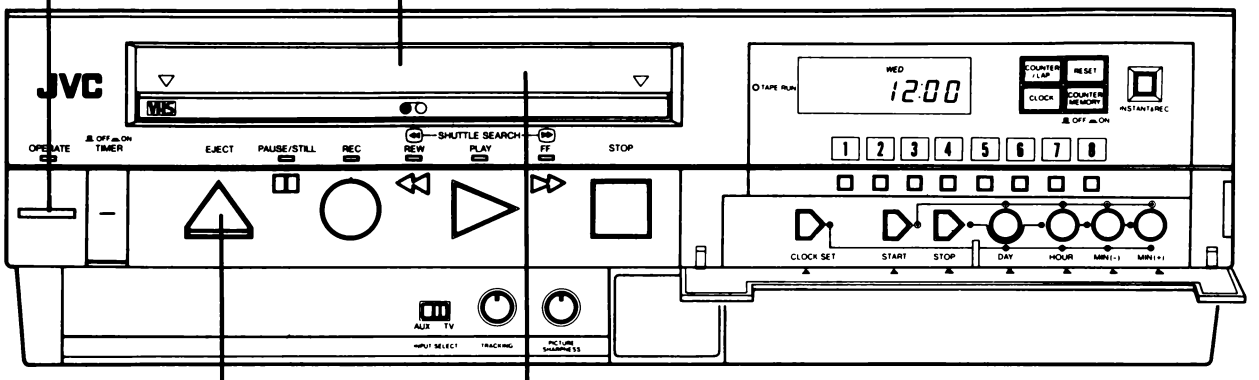
LOADING AND UNLOADING A CASSETTE

Loading

1 Press OPERATE to ON.

2 Insert a cassette with its labelled side facing you.
- With a cassette inserted, the red flap appears and displays the ●O mark to indicate "cassette inserted".

Note:
It might be that after unpacking your new recorder the red door flap with the "cassette inserted" mark is displayed. This is not due to any defect of the unit. Simply insert a cassette. After the first loading/unloading cycle, the door will function properly to show the blue flap when no cassette is inside and the red flap when a cassette is inserted.



Unloading

1 Press EJECT. The cassette will be ejected.

2 Remove the cassette from the loading slot.
- When no cassette is inserted, the blue door flap appears.

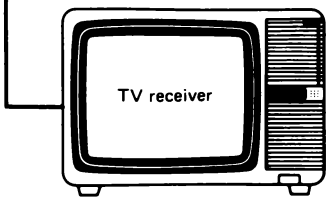
Notes
- Be sure to insert the cassette firmly into the slot; otherwise, it will be automatically ejected.
- The automatic loading mechanism will operate only when the cassette is inserted correctly.
- A cassette inverted cannot be inserted.

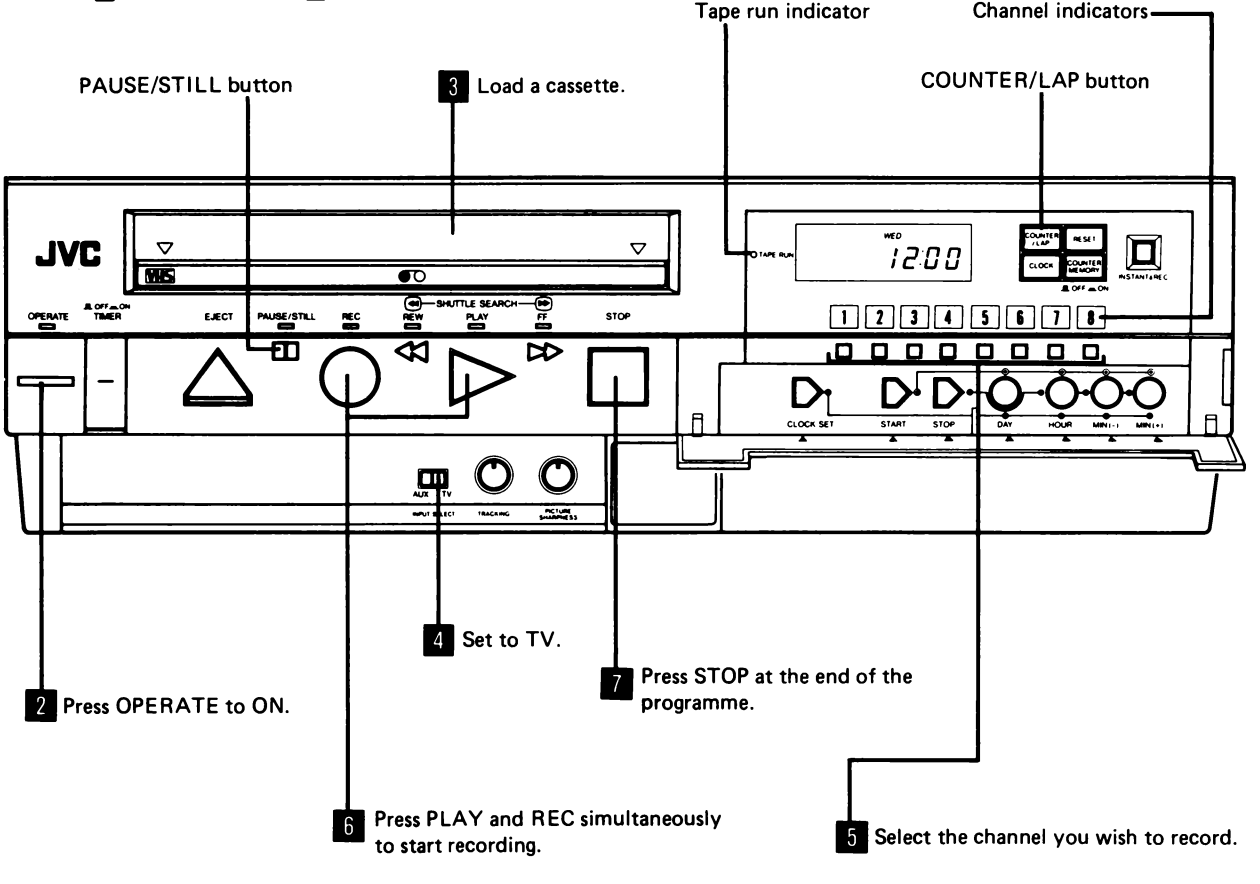
Caution
- Since the HR-D120E employs a motorised cassette loading system, loading and unloading the cassette are only possible when the power is applied to the recorder section. Do not force the cassette into the cassette loading slot while the OPERATE button is OFF.
- Do not attempt to pull out the cassette once automatic loading has started.

RECORDING A TV PROGRAMME WHILE WATCHING IT

Basic concept: receive the desired TV programme with the built-in tuner and operate the tape section for recording.

1 Switch ON.
- Adjust the TV receiver's channel to your video channel.



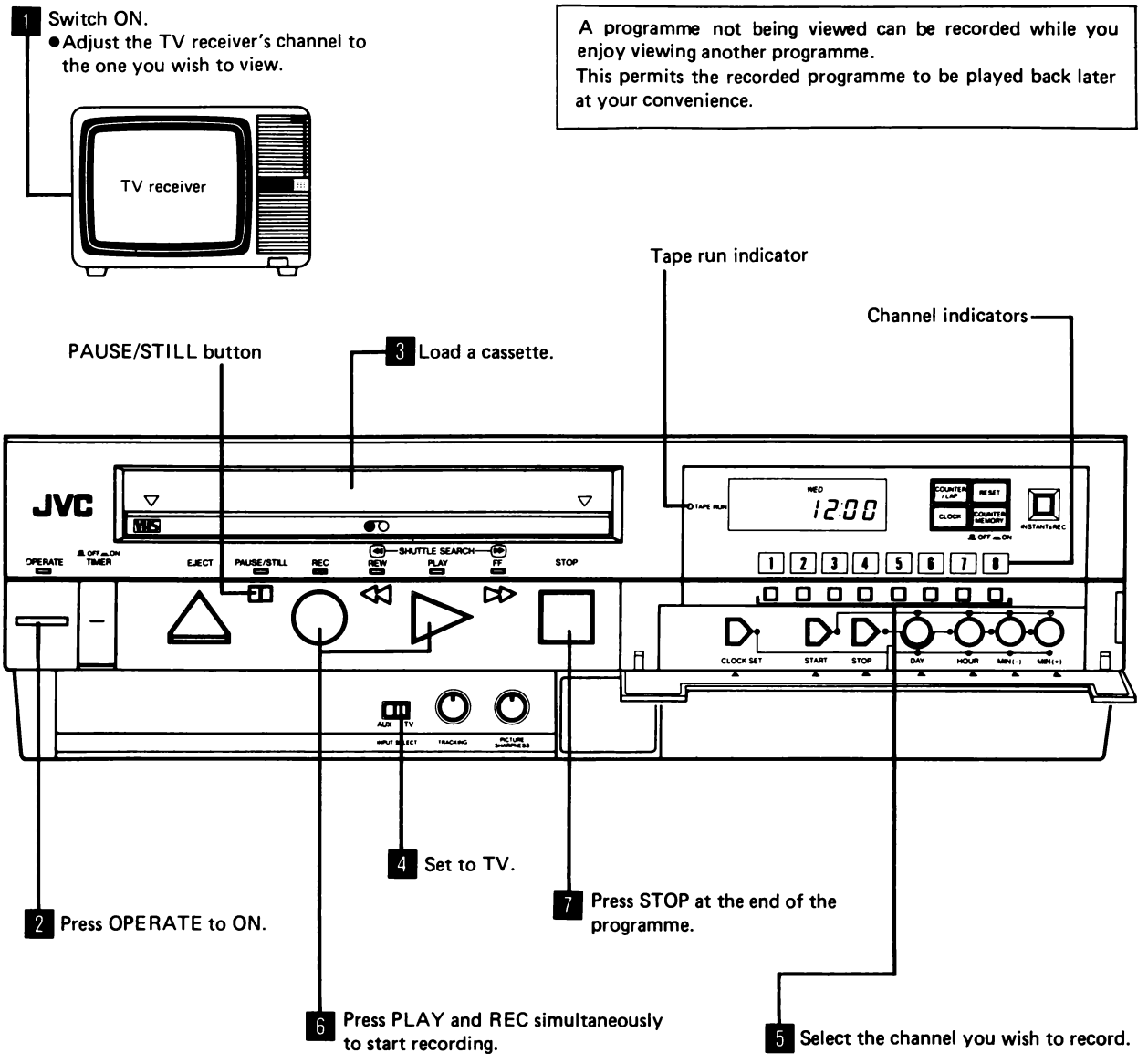


Notes

- If there is part of the programme you don't want to record, press the PAUSE/STILL button. To release the Pause mode, press the PLAY button.
- If the REC button cannot be engaged, check to see if the cassette safety tab has been removed.
- When the end of the tape is reached during recording, the tape is automatically rewound to the beginning and stops.
- Press the COUNTER/LAP button to use the tape counter. (For more details refer to page 16.)
- Press the COUNTER/LAP button once again to check how much recording time has elapsed.

RECORDING A TV PROGRAMME WHILE WATCHING ANOTHER

A programme not being viewed can be recorded while you enjoy viewing another programme.
This permits the recorded programme to be played back later at your convenience.

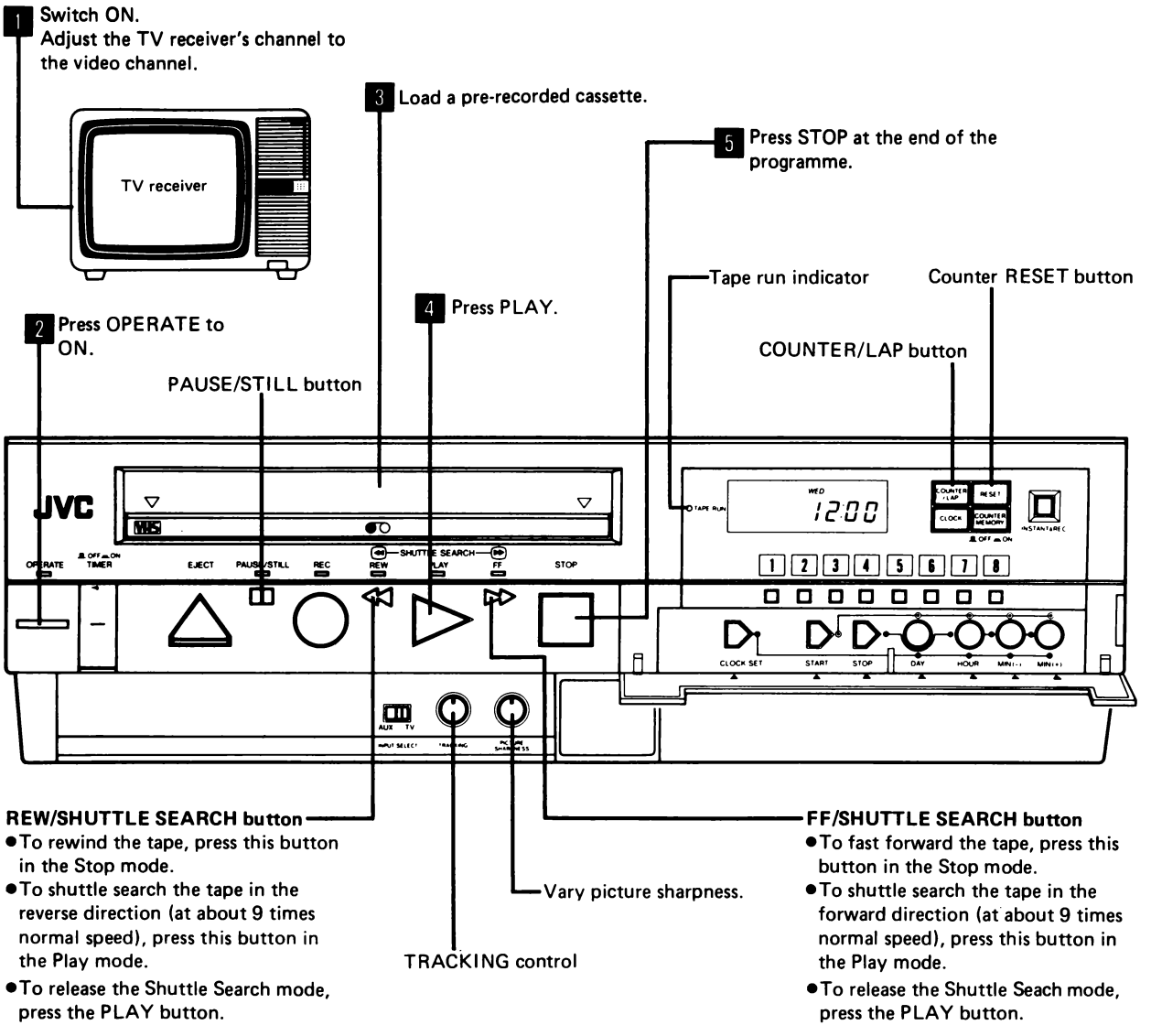


Notes

The key points to be remembered:

- Select the channel you wish to record with the recorder's channel selector.
- Select the channel you wish to view with the TV receiver's channel selector.

PLAYING BACK A VIDEO CASSETTE



REW/SHUTTLE SEARCH button

- To rewind the tape, press this button in the Stop mode.
- To shuttle search the tape in the reverse direction (at about 9 times normal speed), press this button in the Play mode.
- To release the Shuttle Search mode, press the PLAY button.

FF/SHUTTLE SEARCH button

- To fast forward the tape, press this button in the Stop mode.
- To shuttle search the tape in the forward direction (at about 9 times normal speed), press this button in the Play mode.
- To release the Shuttle Seach mode, press the PLAY button.

Notes

- The tape-end auto rewind mechanism functions in both the Play and Fast Forward modes.
- Noise bars may appear on the screen if you play back a tape which was recorded using another recorder. In such cases, adjust the TRACKING control. Turn it in either direction to adjust the picture. After playing a particular tape, return the control knob to the centre position.
- When the PAUSE/STILL button is pressed during playback, a still picture will appear. The still picture can be advanced in a frame-by-frame manner each time this button is pressed.
- When the Still mode continues for longer than 5 minutes, the Stop mode will be entered automatically.

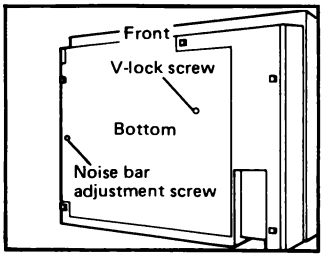
ATTENTION: The following adjustments should be performed at a JVC Service Centre.

Still mode noise bar adjustment

- When operating in the Still mode, noise bars on the screen can be minimised by turning the noise bar adjustment screw on the bottom of the unit in one direction or the other until the noise bars move to the edge of the screen.
- With tapes recorded on other machines, readjustment may be required to minimise noise bars.

V-lock adjustment

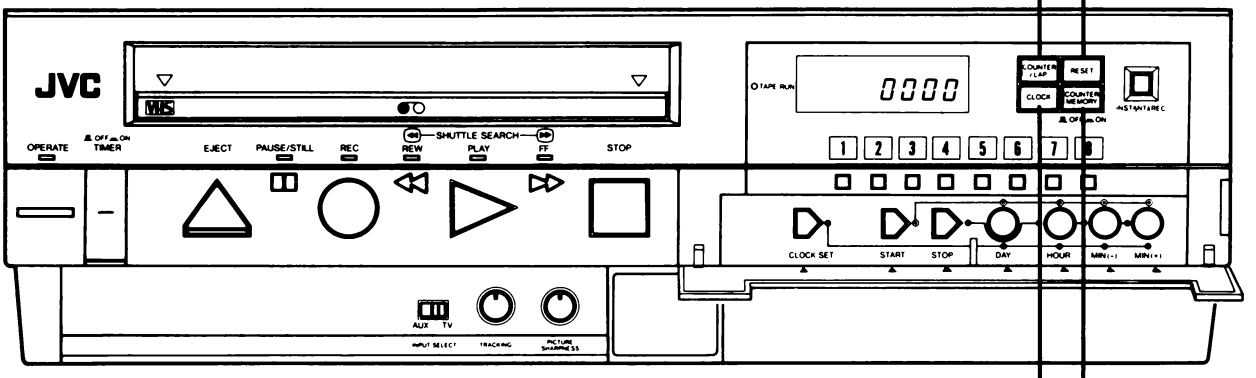
- After making the above noise bar adjustment, adjust the V-lock screw to eliminate any vertical vibration of the picture.
- With some televisions, the still picture may be unstable. This is not due to any defect of the unit.



COUNTER MEMORY AND COUNTER/LAP FUNCTIONS

COUNTER/LAP button
To change the display from the Clock mode to the Counter or Lap mode, press this button.
Pressing it once obtains the Counter mode; pressing it again obtains the Lap mode.
The COUNT or LAP indicator will light correspondingly.

RESET button
Press to reset the counter to "0000" for indexing the tape, or to reset the LAP time to "0:00" for checking the elapsed recording time.



CLOCK button
Press this button to change the display from the Lap or Counter mode to the Clock mode.

Counter Memory function

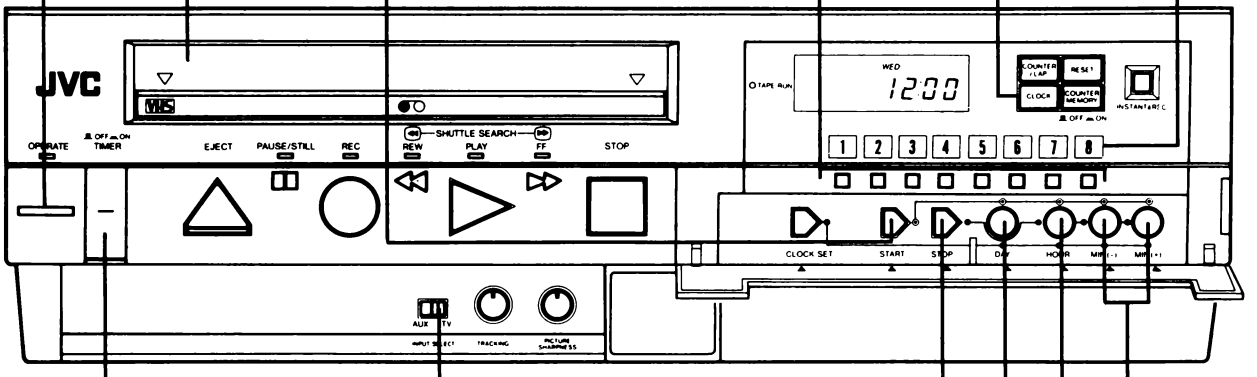
1. Press the RESET button at a point which you may wish to locate later.
   - The tape counter will indicate "0000".
2. Press the COUNTER MEMORY button to ON (▬).
3. Press the REW (or FF) button when you need to return to the designated point.
   The tape will rewind (or fast forward) and stop at about the "0000" counter reading automatically.

Notes

- The LAP time is counted up to 99 hours, 59 minutes.
- Unless the RESET button is pressed in the LAP mode, the count is maintained even after the OPERATE switch is pressed to OFF (as long as the MAINS POWER switch is set to ON).
- When the Lap mode is engaged during playback, counting does not take place, although the current count is displayed.

AUTOMATIC TIMER RECORDING

The built-in 14-day timer permits recording of a selected channel on a preset day from a preset switch-on time to a preset switch-off time.



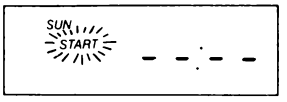
1 Press OPERATE to ON.

2 Load a cassette.

3 Set to TV.

4 Select the channel from which you want to record.

5 Press START for day and switch-on time setting.
- The START indicator on the display will flash and the display will change to the Timer Set mode.

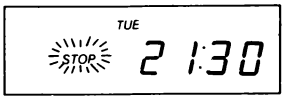


6 Press DAY to obtain desired "day" indication.

7 Press HOUR to obtain desired "hour" indication.

8 Press MIN (+) or MIN (-) to obtain desired "minute" indication.

9 Press STOP for switch-off time setting.
- The STOP indicator on the display will flash.



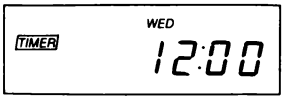
10 Press HOUR to obtain desired "hour" indication.

11 Press MIN (+) or MIN (-) to obtain desired "minute" indication.

12 Press CLOCK to change the display to the Clock mode.
- The Clock mode will also be restored automatically if no command is entered within about 60 seconds.

Channel indicators

13 Press TIMER to ON.
- The TIMER indicator on the display will light.
- If the correct presetting procedure has been followed, the display will show momentarily the START and STOP times in sequence and then again return to the Clock mode.



IMPORTANT INFORMATION ON TIMER RECORDING

Setting the timer

- Enter the data while the START or STOP indicator is flashing (about 60 seconds).
- Any sequence of setting the day, hour and minute is possible.
- Holding the DAY, HOUR, MIN (+) and MIN (-) buttons pressed for more than 1 second continuously advances the indication automatically. Pressing the buttons once advances the indication in single increments only.
- The sequence of day indications: from SUN to SAT, then 2nd SUN to 2nd SAT, then an all-days indication.
  When the timer is set to one day of the week, recording is possible every week on that same day. When the timer is set to the all-days setting, serial recording on an everyday basis is possible.
- After setting the switch-on time, when the STOP button is pressed, initial indication will be the already preset switch-on time.
- Unless the switch-on time has been previously set, switch-off time setting is not possible.
- The switch-off time can be set within 24 hours from the switch-on time. The day indication will change automatically if the hour setting for the switch-off time runs into the following day.

Checking the programmed data

- Checking and re-programming can be performed anytime except while recording is actually taking place according to the programmed data.
- To check or re-programme the timer, the OPERATE button should be in the ON position.
- While recording is actually taking place, the switch-off time can be changed. If the START button is pressed, the switch-on time is displayed, but the START indicator does not flash, indicating that changing of the switch-on time is not possible.

TIMER indicator

- When the TIMER button is pressed to ON with a cassette loaded and the timer correctly programmed, the TIMER indicator on the display will light and the power is turned off.
- If the timer has not been correctly programmed (for instance, the preset switch-on and switch-off times are the same, or no switch-off time has been set), the TIMER indicator will continue to flash. In this case, check the programmed data.
- If the TIMER button is pressed when a cassette is not loaded, the power is not turned off, nor is the Timer mode engaged.
- If a cassette with its safety tab removed has been loaded, it will be ejected automatically when the TIMER button is pressed. The TIMER indicator will not light.

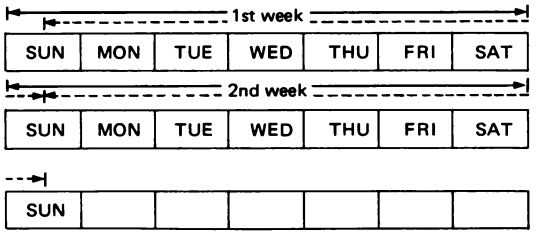
Timer operation

- Tape loading starts 10 seconds before the preset switch-on time and the recording start signal is triggered 2 seconds before the preset time so that recording starts exactly at the preset time.
- After timer recording, the power is switched off and the auto rewind mechanism does not function. If the end of the tape is reached during timer recording, the cassette is automatically ejected and then the power is switched off.
- After a power failure has occurred (refer to page 10, "Power failure indicator"), all programmed data are cancelled.

Two-week timer

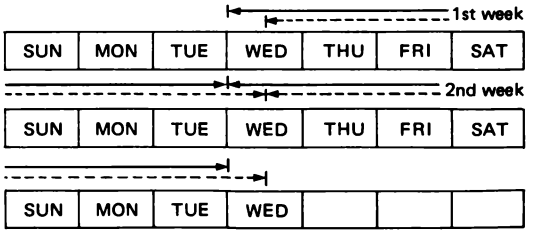
"Two-week" presetting capacity means that you can "reserve" recording on any one of 14 days in advance including the day of setting.

If the current day of setting is Sunday:



- In this situation, there may be no possibility of confusion in setting the day.
- Namely, the "MON" is Monday of the current week and the "2nd MON" is Monday of the next week. The same applies to other week days.
- Regarding Sunday, there are two different cases; one is that you are going to set the timer to a time before the current time of setting and the other is that the preset time is after the current time of setting.
- In the former case, the "SUN" is the next Sunday and the "2nd SUN" is the Sunday after next.
- In the latter case, the "SUN" is the current Sunday and the "2nd SUN" is Sunday of the next week.

If the current day of setting is Wednesday for example:



- Remember that the "MON", "TUE" and so on . . . mean the first coming Monday, the first coming Tuesday, and so on, and not Monday of the current week.
- Similarly, the "2nd MON", "2nd TUE" and so on . . . are the second coming Monday, the second coming Tuesday, and so on, and not Monday or Tuesday of the next week.
- If you are on Wednesday for example, and wish to record something on Tuesday of the next week, the preset data should be "TUE". To record on Thursday of the next week, set "2nd THU".
- Regarding Wednesday, the same as mentioned about Sunday on the left applies.

INSTANT RECORDING

Besides starting and stopping a recording as usual, the HR-D120E offers a more convenient possibility: starting by the push of a single button, and recording will stop automatically after a certain period of time. Use this facility for starting a recording before you go to bed or leave home.

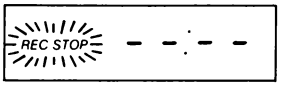
1 Press OPERATE to ON.

2 Load a cassette.

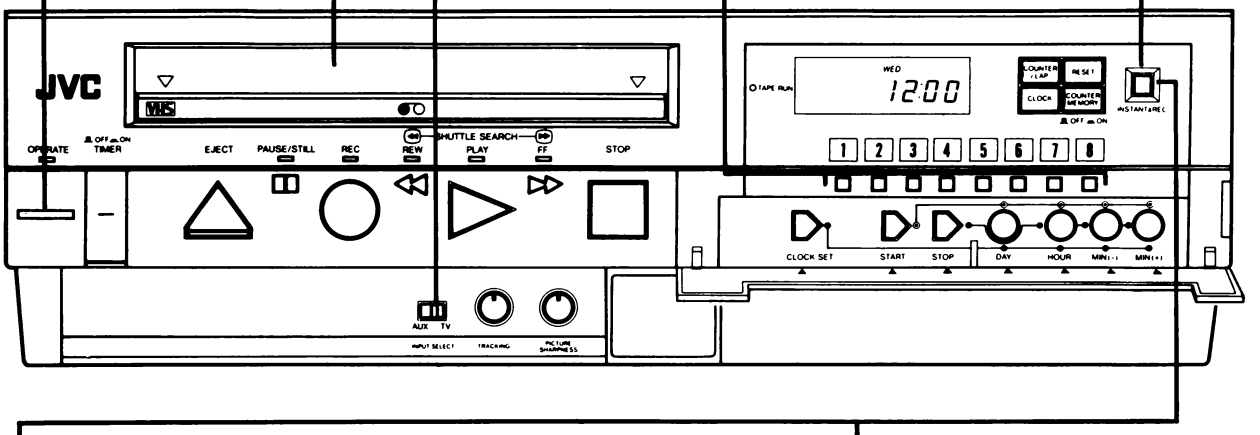
3 Set to TV.

4 Select the channel from which you want to record.

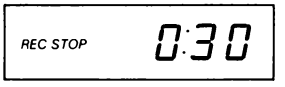
5 Press INSTANT REC.
- The following indication will appear on the display, to show that the recorder is ready to start recording.
- The REC STOP indicator on the display will flash.



Caution:
Never press the INSTANT REC button while a cassette is in the process of being loaded.



6 Press INSTANT REC once again.
- Recording will begin immediately and the following indication will appear on the display, showing that recording will automatically stop and power will switch off after 30 minutes.
- The REC STOP indicator remains lit.

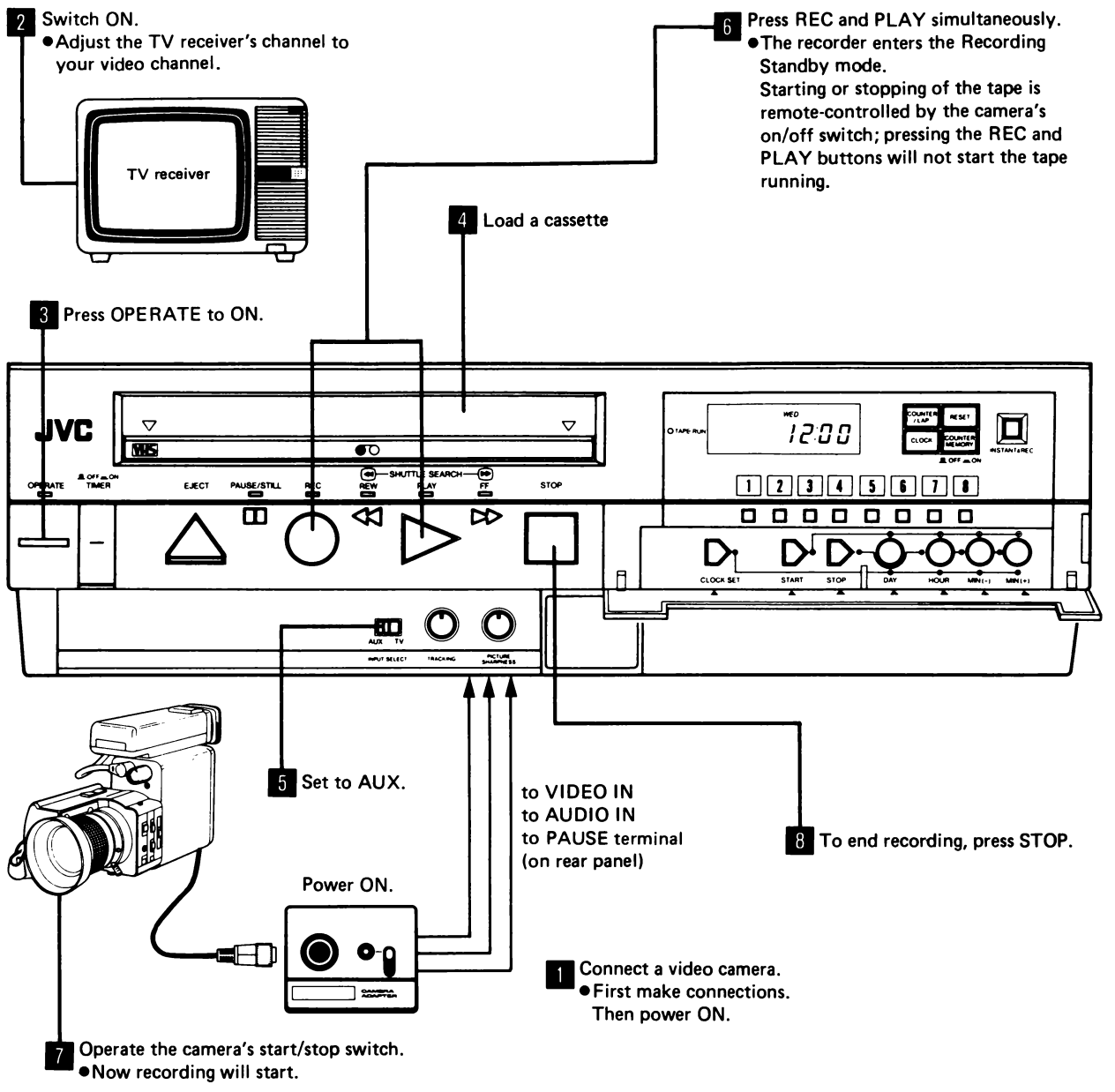


7 Each time the INSTANT REC button is pressed, recording time increases by 30 minutes.
- For a more precise time setting, use the HOUR, MIN (+) and MIN (-) buttons to set to the exact time required.

Notes

- If the INSTANT REC button is not pressed a second time within about 10 seconds after it has been pressed once, the Instant Record mode will be cancelled and the display will change back to the Clock mode.
- Timer setting in the Instant Record mode is possible up to a maximum of 4 hours when the INSTANT REC button only is used. If the MIN (+) button is used after 4:00, this setting can be increased up to 4 hours, 59 minutes. If 4:59 is to be obtained, simply press the MIN (-) button once.
- While recording is in progress, the displayed time counts down; when 0:00 is reached, the Record mode is released after 10 seconds and the power is switched off.
- Once you have started recording in the Instant Record mode, you cannot stop recording with the STOP button. To stop recording, press the OPERATE button to OFF or obtain the timer indication of "0:00" using either the INSTANT REC or time setting buttons.
- The instant recording function can also be used as a sleep timer. If you press the INSTANT REC button during normal recording, the REC STOP indicator will light on the display and the indication "0:30" will be obtained, showing that recording will stop automatically after 30 minutes. The time span can be adjusted in the same way as for instant recording up to 4 hours, 59 minutes.
- Instant recording has priority over all other modes; you can start recording from any mode using the INSTANT REC button, even from rewind or fast forward.
- If the INSTANT REC button is pressed with a non-recordable cassette loaded (one with its safety tab removed), the cassette will be automatically ejected and the power will be switched off.
- If you want to perform instant recording after you have set the timer and pressed the TIMER button to ON, press the TIMER button once again to OFF, then power will switch on and you are ready to perform instant recording. The preset time for instant recording has priority over the programmed preset times.
- If the programmed switch-on time for a timer recording should come after the switch-off time of the instant recording, this timer recording can still be made by simply pressing the TIMER button to ON after instant recording has finished.

RECORDING WITH A VIDEO CAMERA



Notes

- If feedback noise (whistling or howling) is heard from the TV receiver, reduce the volume or move the microphone, being used, farther away from the TV receiver.
- When a video camera is connected to the recorder via an adapter as illustrated with its remote control cable plugged into the remote PAUSE terminal, the recorder enters the Pause mode.
- For camera operation refer to the instruction manual for the relevant camera.

IN CASE OF DIFFICULTY

What may initially appear to be trouble is not always a real problem. Make sure first . . . . .

Symptoms	Check points
No power is applied to the HR-D120E.	• Is the power cord disconnected? Connect it.
The channel indicator is illuminated, but the recorder fails to function.	• Is the TIMER button pressed to ON? Release it by pressing.
Playback picture does not appear while the tape is running.	• Is the TV receiver's channel selector set to an occupied channel? Set to the RF converter channel.
Tape does not run in the Record mode.	• Is the PAUSE/STILL button pressed? Press PLAY to release.
REC button cannot be engaged.	• Is the cassette improperly loaded? Load it properly. • Is the safety tab broken? Reseal the slot.
Tape stops in the Rewind or Fast Forward mode.	• Is the COUNTER MEMORY button set to ON? Set to OFF.
Tape will not rewind.	• Is the tape already rewound to the end?
TV broadcasts cannot be recorded.	• Is the INPUT SELECT switch set to AUX? Set to TV.
Noisy playback picture.	• Adjust with the TRACKING control. Return the control to its centre position after playing back the particular tape.
Pressing PAUSE/STILL during still playback brings a still picture (in a frame-by-frame manner) with noise bars.	• Noise bars can be eliminated by pressing the PAUSE/STILL button a few more times.

HEAD CLEANING

- Picture playback may become blurred or interrupted while the TV programme received is clear. This does not mean that the recorded programme has been erased.
- Dirt accumulated on the video heads after long periods of use causes such problems. In this case, head cleaning requiring highly technical care is necessary.

For head cleaning, consult the nearest JVC Dealer.

SPECIFICATIONS

Format	: VHS PAL standard
Recording system	: Rotary, slant azimuth two-head helical scan system
Video signal system	: PAL colour and CCIR monochrome signal, 625 lines
Tape width	: 12.65 mm
Playing time	: 240 minutes with E-240 video cassette
Temperature	
Operating	: 5°C to 40°C
Storage	: -20°C to 60°C
Channel coverage	: VHF BAND I, channels 2 – 4, VHF BAND III, channels 5 – 12, UHF BAND IV/V, channels 21 – 69
Aerial output	: UHF channels 32 – 40 (adjustable)
Power consumption	: 30 watts
Power requirement	: 220 V∿, 50/60 Hz
Video	
Input	: 0.5 to 2.0 Vp-p, 75 ohms unbalanced
Output	: 1.0 Vp-p, 75 ohms unbalanced
Signal-to-noise ratio	: More than 43 dB (Rohde & Schwarz noise meter) with PICTURE SHARPNESS control at centre position
Horizontal resolution	: 250 lines with PICTURE SHARPNESS control at centre position
Audio	
Input	: Line: -20 dBs 50 k-ohms unbalanced
Output level	: -6 dBs, high impedance load
Output impedance	: 1 k-ohm, unbalanced
Signal-to-noise ratio	: More than 40 dB
Frequency range	: 70 Hz to 10,000 Hz
Timer	: 14-day/1-programme timer
Dimensions	: 435 mm(W) x 130mm(H) x 368 mm(D)
Weight	: 9 kg
Provided accessories	: Aerial cable, Video cassette tape, Infrared remote control unit RM-P12E, "R6" battery x 2

Design and specifications subject to change without notice.

SECTION 1
GENERAL DESCRIPTION

1.1 GENERAL OUTLINE

The VHS system achieves very low tape consumption and uses low cost video cassette tape. Recording time in the standard mode has become 3 hours.

Increased recording time results from the narrow gap video heads, high sensitivity video tape and the slant azimuth recording head configuration which eliminates the need for a guard band between recorded tracks.
In addition, the VHS format takes into consideration special operating modes such as still picture, slow motion and speed playback. The design also allows switching over between the SECAM and NTSC television standards.

Adoption of the VHS format presented several technical challenges. Foremost among these were obtaining high picture quality and high resolution despite the slow (4.9 meters per second) relative speed between the tape and video heads, improving signal to noise ratio (S/N), and preventing black to white reversal phenomena due to the short recording wavelength of 1.0 μm. Also the $\pm 6^{\circ}$ azimuth angle of the video heads alone is not sufficient to eliminate crosstalk from the lowband converted color signal.

Steps for solving these difficulties included adoption of a nonlinear emphasis circuit and selecting the emphasis amount for optimum S/N. The reversal problem was overcome by using a double limiter circuit, while a phase shift system has been designed for eliminating color crosstalk.

The following discussion covers several main points of the VHS format.

1.2 MECHACON FUNCTIONS IN VARIOUS MODES

1.2.1 OPERATE switch ON

1) OPERATE LED lights.
2) Stop mode is entered.
3) If the unloading switch is off, unloading is performed, then the Stop mode is entered.
4) If both the housing up and housing down detector switches are off, the cassette housing becomes raised.
5) After AC power interruption, the OPERATE LED does not light when the OPERATE switch is set to ON.

1.2.2 Cassette housing up and down states

1) During the cassette setting process, if the cassette in detector switch becomes off, the cassette is ejected.
2) If the housing is not lowered completely within approximately two seconds, the emergency mode becomes engaged. Machine operations are inhibited and the OPERATE LED remains lighted.
3) This state is also produced if the housing is not completely raised within approximately 2 seconds.

1.2.3 Operating modes

1) The PLAY, FF and REW LED's light during their respective operating modes.
2) During Search and Play-Pause operation, both the PLAY and the selected FF, REW or PAUSE LED's light. With this model, the Search mode is locking and continues after the hand is removed from the button.
3) Both the PLAY and REC LED's light during the Recording mode. In Recording-Pause, the PLAY, REC and PAUSE LED's light.
4) If tape loading is not completed within approximately 8 seconds, unloading is performed and the Stop mode entered.
5) If tape unloading is not completed within approximately 8 seconds, the emergency mode is engaged. The OPERATE LED remains lighted and all machine operations are inhibited.
6) At the beginning of the tape in the Rewind mode, short FF is performed to the tape starting point, then the Stop mode is entered.
7) At the end of tape in the Fast Forward mode, short Rewind is performed to the tape end point, then the Stop mode is entered.
8) When the beginning of tape is reached in the Search Rewind mode, unloading is performed and the Stop mode entered.
9) When the end of tape is reached in the Play, Recording or Search FF mode, unloading is performed and the Stop mode is entered.
10) When the COUNTER MEMORY switch is ON during FF or REW, the Stop mode becomes entered when the tape counter indication reaches 0000.
11) In the FF or REW mode, if the take up reel disk rotation stops for approximately 2 seconds, the Stop mode is entered.
12) In the Play, Recording, Search FF and Search REW modes, if the take up reel disk rotation stops for approximately 2 seconds, unloading is performed and the Stop mode entered.

13) If rotation of the drum motor stops for approximately 2 seconds in the Play, Recording, Pause and Loading modes, unloading is performed and the Stop mode entered.
14) If the Pause mode continues for more than 4 to 6 minutes, unloading is performed and the Stop mode entered.

1.2.4 Timer switch ON

1) If the REC safety switch is off, the cassette becomes ejected.
2) During timer recording, if the REC safety switch becomes off, unloading is performed and the cassette is ejected.
3) At completion of timer recording, the REC Pause mode is entered, then power is switched off.
4) At the end of tape in the timer recording mode, unloading is performed and the cassette is ejected.
5) During timer recording, if the take up reel disk rotation stops for approximately 2 seconds, the REC Pause mode is entered and power switched off.
6) If the drum motor rotation stops for approximately 2 seconds during timer recording, the REC Pause mode is entered and power switched off.
7) If loading continues for more than approximately 8 seconds, unloading is performed and the Stop mode entered. Afterwards, power is switched off.
8) If unloading requires more than approximately 8 seconds, the emergency mode is engaged. The OPERATE LED lights and all machine operations are inhibited.

1.2.5 Mode Shift Table

Refer to Section 4.4.25.

1.3 TIMER FUNCTIONS AND OPERATION

1.3.1 Clock

1) Reference	Synchronized to AC power line frequency; automatic switching between 50 Hz and 60 Hz
2) Backup	5 seconds (5 sec to 20 sec); count not performed during backup
3) Initial indication	Flashing SUN 0:00 also produced after prolonged power interruption; pressing the CLOCK SET button once yields the "present time" setting mode; seconds count begins, but not displayed
4) Seconds reset	Seconds are reset by pressing the CLOCK SET button 29 sec or less: reset to 00 30 sec or more: increment 1 minute

5) Time setting procedure
Simultaneously press the CLOCK SET and the desired DAY, HOUR, MIN (-) or MIN (+) button. The indication changes 1 digit with each pressing. If the buttons are held depressed, digit change becomes continuous at approximately 3.5 Hz for day and hour, and approximately 5 Hz for minutes.
* Day, hour and minutes setting can be performed in any sequence.
* Setting cannot be performed with the OPERATE switch OFF, or the TIMER switch ON.
* With the TIMER switch OFF, the clock can be set even while instant recording is in progress.

6) Power absence
When power is interrupted, the microprocessor function stops and the time count ceases.
* If power is returned before the backup time elapses, the time display mode becomes returned. In this case, if the TIMER and OPERATE switches are ON, and a program has been set for recording, timer recording can be performed.
* If the backup time elapses before power returns, the initial indication (above item 3) becomes produced.

1.3.2 Program functions

1) Recording start time setting
* Press the START button and the START inscription flashes. The recording start time setting mode becomes entered and latched. If 60 seconds elapse without a button input, the previous display mode becomes returned.
* When setting the recording start time, the DAY, HOUR, MIN (-) and MIN (+) buttons can be pressed in any sequence.
* Pressing the DAY button changes the day indication in the following manner.

2) Recording stop time setting
* Press the arrow-shaped STOP button. The STOP incription flashes and the recording stop time setting mode is entered and latched. If 60 seconds elapse without a button input, the previous display mode becomes returned.
* If the recording stop time has not yet been set, the recording start time becomes displayed as the initial value.
* The DAY setting button is nonfunctional at this time.
* If the recording start time has not been set, the recording STOP button is nonfunctional.
* The HOUR, MIN (-) and MIN (+) buttons can be pressed in any desired sequence.
* If the recording stop time setting is earlier than the start time setting, the stop time becomes shifted to the next day.
* The MIN (-) and MIN (+) buttons do not increment the hour.

* The maximum stop time setting is 23 hours 59 minutes.

1.3.3 Timer recording operation

1) The prestart output is produced 10 seconds prior to the recording start time.
2) The recording start output is produced 2 seconds before the recording start time.
3) Both the prestart and recording start commands cease at the recording stop time.
4) After completion of timer recording, the program settings are held.
5) Daily and weekly program repeat functions are provided.

1.3.4 Program entry complete

1) Cassette capable of recording (safety tab present) had been inserted. If the safety tab is absent, when the TIMER switch is set to ON, eject becomes performed and the TIMER inscription does not light.
2) OPERATE switch ON.
3) Different start and stop times have been set. If these are the same, or if the stop time has not been set, the TIMER inscription flashes at 2.5 Hz when the TIMER switch is set to ON. However, if the program contents have not been cancelled and the TIMER switch is set to off, the TIMER inscription does not light.

1.3.5 Setting corrections and checks

1) Except while timer recording or instant recording is in progress, program settings can be changed by setting the OPERATE switch ON.
2) While timer recording is in progress, the stop time and the channel can be changed.
3) The program can be checked by setting the OPERATE switch to ON. The channel indication lights in the Recording, Pause and Stop modes (when E-E 12 V output is produced).
4) During timer recording, if the START button is pressed, the START inscription does not light and the start time cannot be corrected.
5) During the power interrupt display, program check and correction cannot be performed. Timer recording is also inhibited.
6) In the timer recording mode, if the TIMER switch is set to OFF, normal recording continues until the STOP button is pressed. Afterwards, returning the TIMER switch to ON does not resume timer recording, even if time remains in the entered program.
7) In the above situation, if the STOP button has not been pressed, returning the TIMER switch to ON produces the Standby mode (tape remains loaded and TIMER inscription lights).

1.3.6 Mode return

1) In the Counter, Lap or Present Time mode, if the START or STOP setting button is pressed, but a command input is not provided within 60 seconds, the setting enable status becomes cancelled.
2) With timer recording enabled (cassette present; different recording start and stop times), setting the TIMER switch from OFF to ON produces the recording start time display for 2 seconds, followed by the stop time for 2 seconds, then the clock or instant recording indication becomes returned. During this process, the TIMER inscription lights.

1.3.7 Instant recording

1) Pressing the INSTANT REC button once yields the following display (recording not performed).
2) Pressing the INSTANT REC button a second time sets 30 minutes of recording time and the REC STOP inscription lights. Each time the button is pressed thereafter, 30 minutes are added to the recording time, up to a maximum of 4 hours. In this case, pressing the button continuously does not produce continuous increase.
3) With the OPERATE switch ON, recording begins when 30 minutes or more of recording time are set.
4) Remaining time is decremented in 1 minute units.
5) The Instant Recording mode becomes released 10 seconds after 0:00 indication is reached.
6) In absence of a cassette or if the erase protector tab is missing, pressing the INSTANT REC button yields the Eject mode.
7) The Instant Recording mode has priority over timer recording. If Instant Recording is set so that it overlaps a previously set timer recording period, it becomes performed first, then if time remains in the timer recording period, that mode is entered.
8) During Instant Recording, the remaining time is displayed and the REC STOP inscription lights.
9) Setting correction
    1. During Instant Recording, while remaining time is displayed, pressing the INSTANT REC button adds 30 minutes to the time. Again pressing the button provides another 30 minutes, and so forth up to a maximum of 4 hours. Continuous pressing of the button does not yield continuous increase.
    2. Pressing the HOUR, MIN (-) or MIN (+) button changes the selected setting by 1 digit. The maximum recording time that can be set in this manner is 4 hours 59 minutes.
    3. If the REC STOP indication reaches 0:00 during correction, the Instant Recording mode becomes released 10 seconds afterwards.
    4. While Instant Recording is in progress, pressing the REC START or STOP button produces the selected display, but correction is inhibited at this time.

1.3.8 Counter

1) The counter display is produced with the OPERATE switch ON and the COUNTER/LAP button pressed.
2) In any mode with the OPERATE switch ON, pressing the COUNTER/LAP button yields the counter mode.
3) The counter mode remains latched as long as another mode button is not pressed.
4) If Instant Recording is in progress, the remaining time display becomes returned after 60 seconds.
5) Setting the OPERATE switch OFF releases the counter mode. At this time, the COUNTER/LAP button does not function.
6) In the counter mode, with the OPERATE switch ON, pressing the COUNT/LAP button yields the lap mode. This is not released until the button is pressed again, however, the counter data are retained.
7) During counter indication, pressing the COUNT/LAP button produces the lap indication.

1.3.9 Counter reset

1) In the counter mode, pressing the RESET button resets the count. So long as the button is held depressed, count is not performed.
2) Inserting a cassette does not reset the count.

1.3.10 Zero output

1) The zero output is produced only when the count is 0.
2) The zero output is not related to the OPERATE switch ON/OFF or TIMER switch ON operations.

1.3.11 Lap time

1) Count is performed only during recording, up to 99 hours 59 minutes.
2) In the counter mode, pressing the COUNT/LAP button produces the LAP mode.
3) Pressing the COUNT/LAP in other than the Recording mode yields LAP 0:00 indication, but count is not performed.
4) The lap indicating mode is latched as long as another button is not pressed. However, during Instant Recording, after 60 seconds, the recording remaining time indication becomes returned.

1.3.12 Lap time release

1) Setting the OPERATE switch to OFF releases the lap time mode and produces the clock mode, At this time, the COUNT/LAP button is deactivated.
2) Releasing the Recording mode returns the counter mode.

1.3.13 Lap time reset

1) During lap display, reset is performed by pressing the RESET button. Count is not performed while the RESET button is held depressed.
2) Exchanging the cassette does not reset the lap time.

1.3.14 Tape running indicator

1) With the OPERATE switch ON, the tape running indicator flashes in accordance with tape transport, regardless of the display mode.
2) The flashing period is synchronized with the count pulse from the Mechacon circuit.
3) The indicator lights with a high count pulse and extinguishes with a low pulse.
4) When a high pulse level continues for more than 1 second, the indicator extinguishes 1 second after the pulse rise to high level.

1.3.15 Station selection

System	8 channel; mechanical locking
Indication	LED channel numbers shown by replaceable film strips; with the OPERATE switch ON, channel indication is provided only when the INPUT SELECT switch is set to the TV position.

SECTION 2
MECHANICAL ADJUSTMENT

2.1 GENERAL

2.1.1 Precautions

IMPORTANT:

1. Disconnect from power before removing or soldering components.
2. When removing a screw from the chassis, be careful not to drop it into the mechanism. If a screw should be dropped, be sure to retrieve it.
3. Be extremely careful not to damage either the upper or lower head drum assemblies.
4. The tape transport mechanism has been precisely adjusted at the factory and ordinarily does not require readjustment.
5. When removing a part, be very careful not to damage or displace other parts. (Be especially careful with the guide poles and rotary video head drum.)
6. The cassette housing retracting mechanism presents a hazard of possible injury to fingers or hand due to the differing construction with respect to earlier models. The technique of "tripping" the lowering mechanism with the fingers, as employed with previous versions, must not be used with this model. For the instructive service procedure, see section 2.3.1.
7. Tighten the screws carefully to avoid damage to the cabinet.

2.1.2 Required jigs and tools

For proper mechanical adjustment, the following jigs and tools are strongly recommended. Without them, a long trial-and error period would be necessary.

In addition, general-purpose tools and a metric hex key (not supplied by JVC) are required.
The hex key needed for this model is 1.5 mm size.

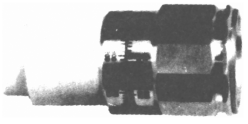
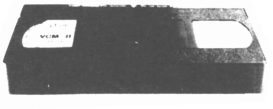
JVC Alignment tape MH-2	Master plane jig PUJ42146	Height gauge PUJ42147-2	JVC oil PU41761
Torque gauge ass'y PUJ48075-2 (Torque meter 600ATG, Torque gauge head PUJ48016-2) 	Back tension cassette gauge PUJ48076 	Audio/Control head position tool PUJ47351-2	

Table 2-1 Jigs and tools

NOTE: See section 3.1.1 required test equipment and jigs regarding electrical adjustment.

2.1.3 Diassembly

A: External covers

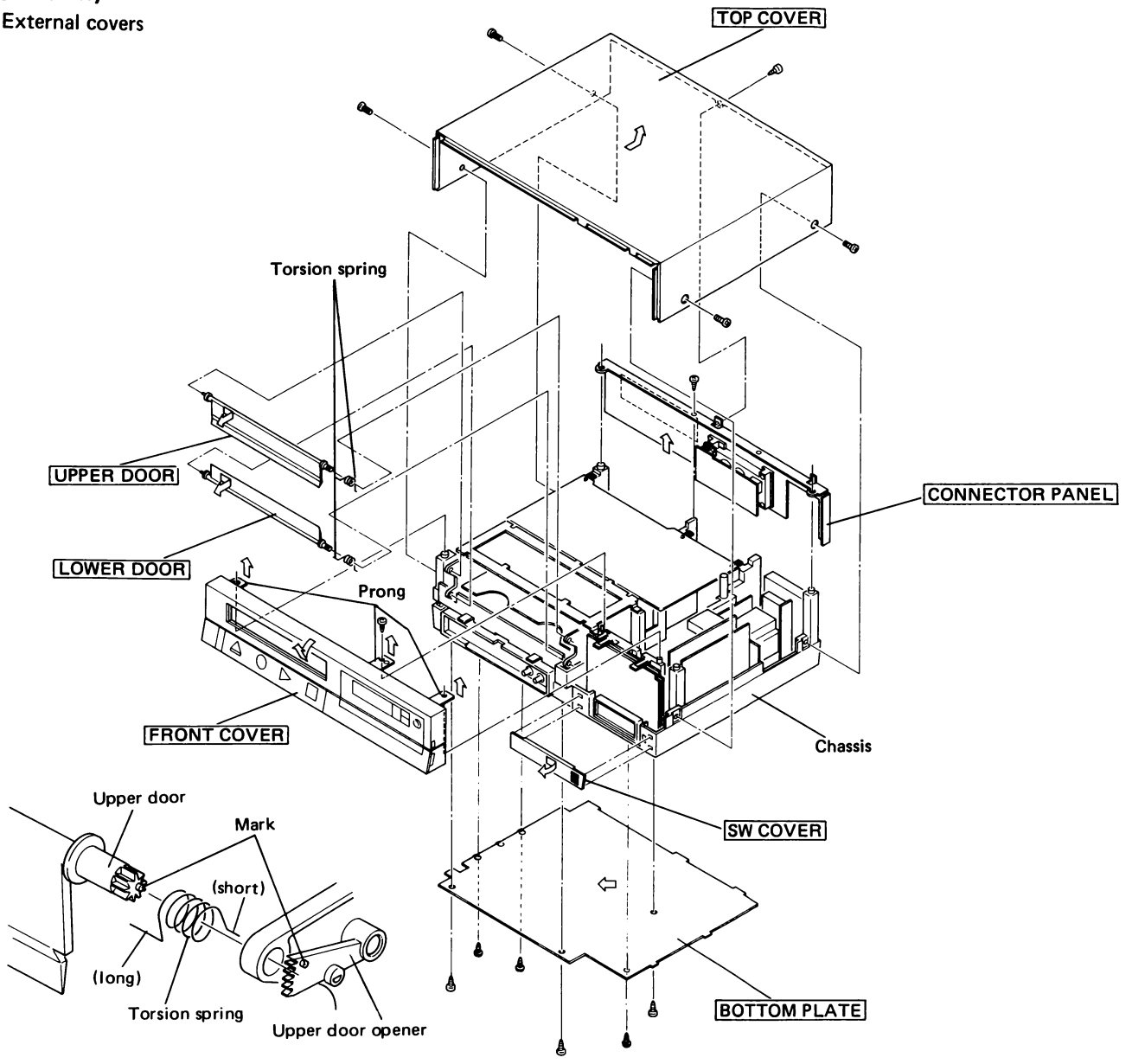


Fig. 2-1(a) External covers

- Top cover
  1. Take out five screws and move the top cover in the arrow direction to remove it.
- Front cover
  1. Remove the top cover.
  2. Take out a screw and pull the three prongs upwards to disengage from chassis.
  3. Move the front cover in the arrow direction to remove it.
- Bottom plate
  1. Take out six screws and move the bottom plate in the arrow direction to remove it.
- Connector panel
  1. Remove the top cover.
  2. Take out a screw and pull the connector panel upwards to remove it.
- Upper door and lower door
  1. Remove the front cover.
  2. Move the lower door in the arrow direction to remove it. Use care regarding the torsion spring.
  3. In the same manner, move the upper door in the arrow direction to remove it. Use care regarding the torsion spring.
  4. When reassemble the doors, perform the following
     1) Observe the upper door and recognize the mark on the gear portion.
     2) Set the long straight part of the torsion spring toward the upper door.
     3) Install the upper door in the state with the mark corresponding with the mark of the upper door opener on the cassette housing.
- SW cover
  1. Move the SW cover in the arrow direction to remove it.

B: Circuit board assemblies

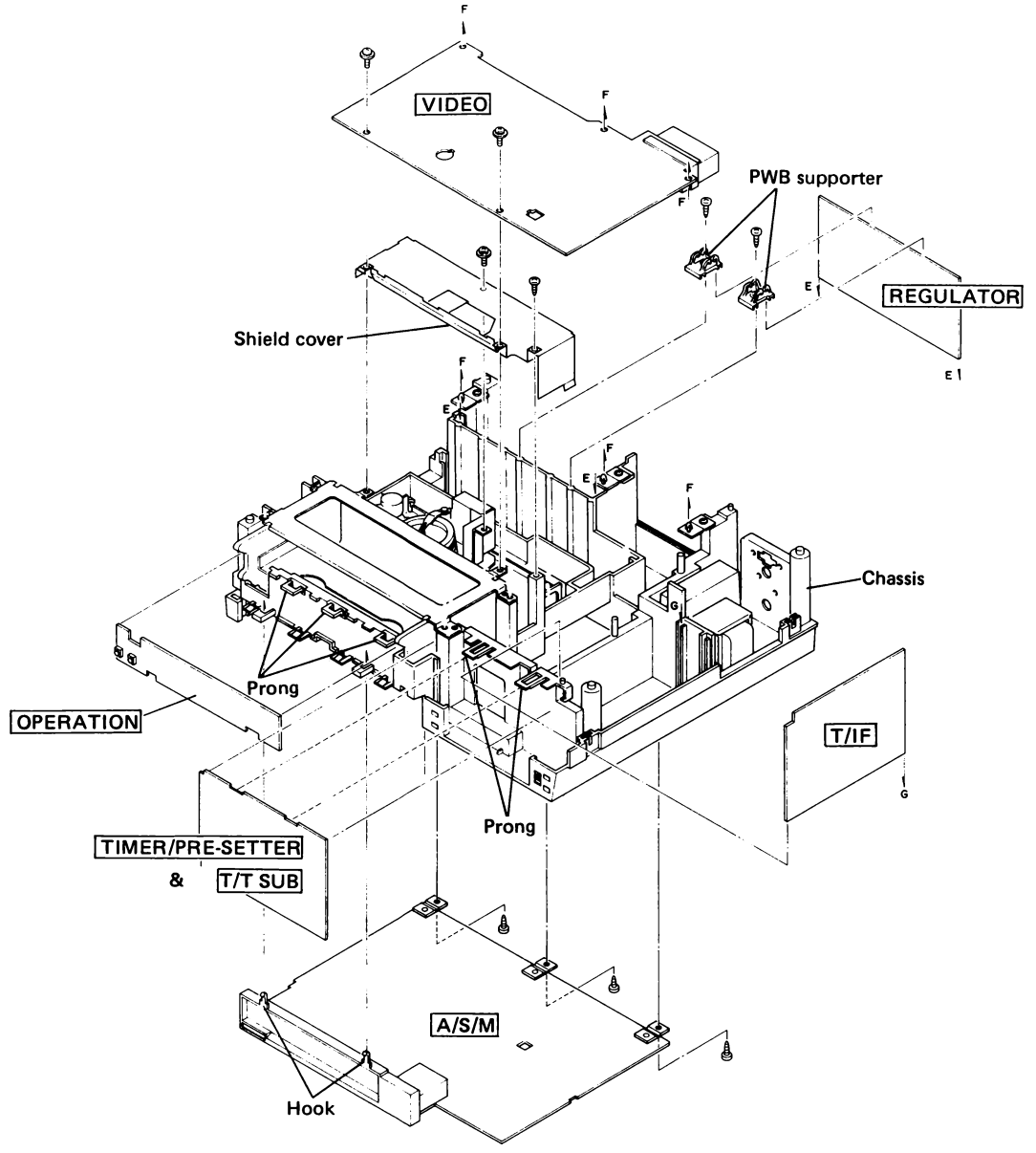


Fig. 2-1(b) Circuit boards

- VIDEO board
  1. Take out two screws and disengage the VIDEO board from three hinges mounted on chassis to remove it.
- REGULATOR board
  1. Take out two screws and remove the PWB supportors.
  2. Pull the REGULATOR board upwards from guides of chassis to remove it.
- OPERATION board
  1. Bend three prongs of chassis upwards to remove the OPERATION board.
- A/S/M board
  1. Remove the OPERATION board.
  2. Bend two hooks of VIDEO board to disengage them from chassis.
  3. Take out three screws and remove the A/S/M board.
- TIMER/PRE-SETTER and T/T SUB boards
  1. Bend two prongs of chassis upwards to remove the TIMER/PRE-SETTER and T/T SUB boards.
- T/IF board
  1. Pull the T/IF board upwards from guides of chassis to remove it.

2.1.4 Layout of main mechanical parts

A: Top view and parts identification

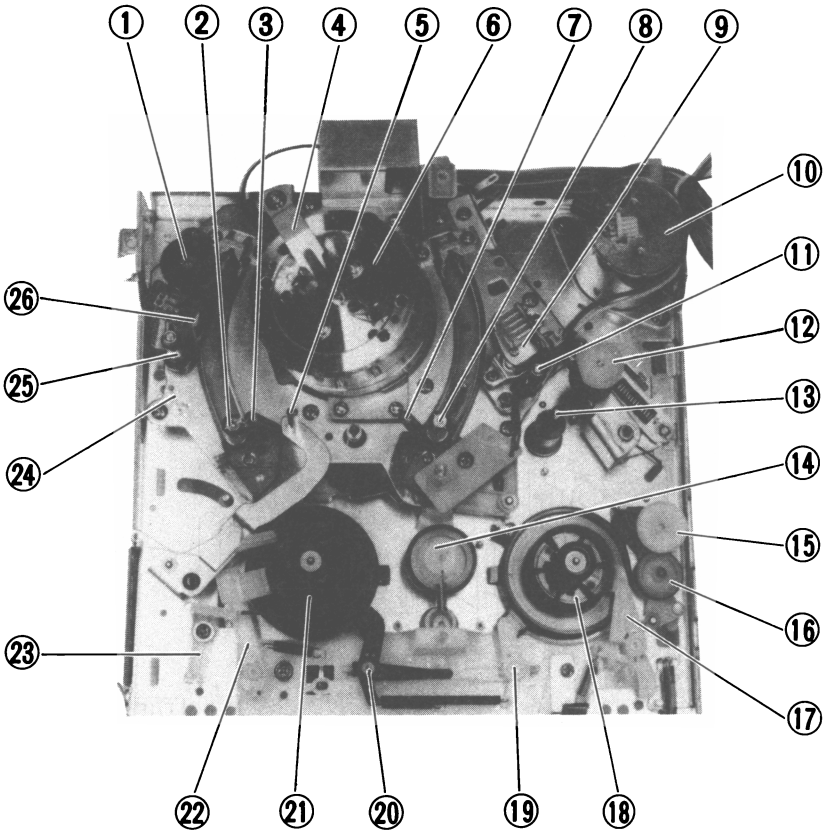


Fig. 2-2(a)

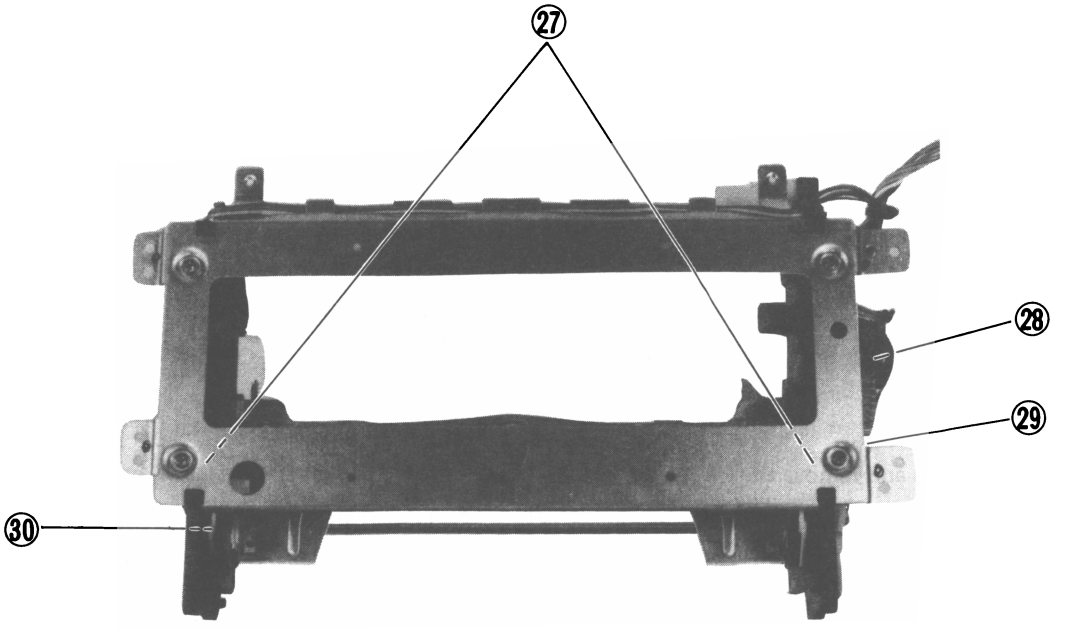


Fig. 2-2(b)

B: Bottom view and parts identification

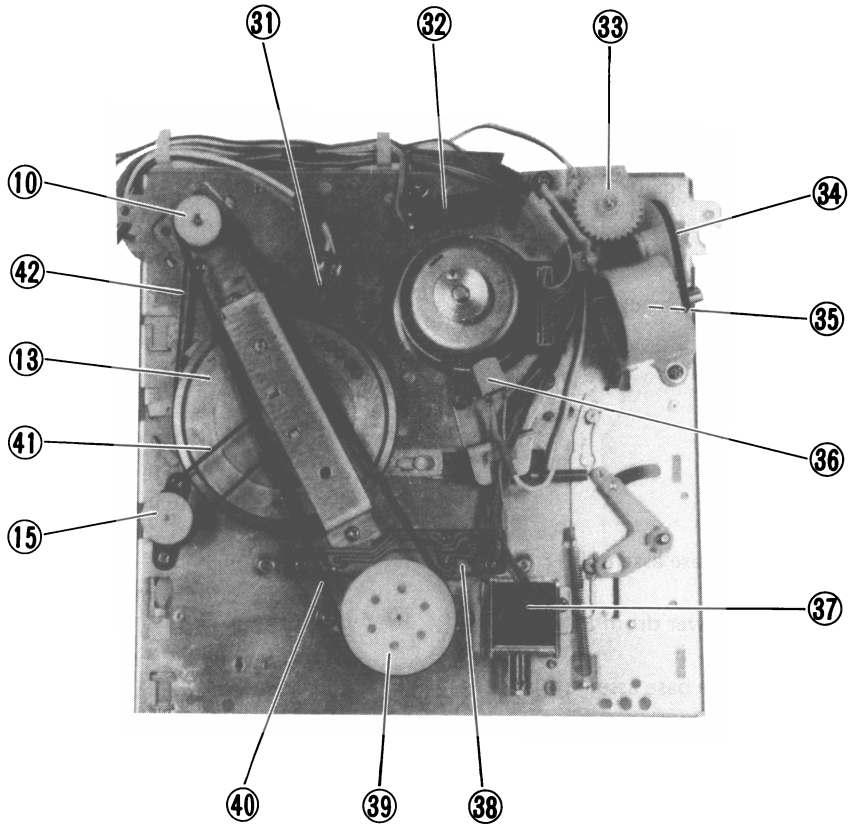


Fig. 2-2(c)

1 Impedance roller
2 Supply guide roller
3 Slant pole (Supply pole base ass'y)
4 Brush
5 Tension pole
6 Upper drum
7 Slant pole (Take-up pole base ass'y)
8 Take-up guide roller
9 Audio/control head
10 Capstan motor (— pulley)
11 Take-up guide pole
12 Pinch roller
13 Capstan (Flywheel ass'y)
14 Reel idler
15 Take-up clutch
16 Take-up idler arm
17 Take-up tension brake
18 Take-up reel disk
19 Take-up brake
20 Supply brake
21 Supply reel disk
22 Supply tension brake
23 Tension band
24 Guide pin
25 Supply guide pole
26 Full erase head
27 CASSETTE-IN detect switch
28 Cassette motor
29 HOUSING-UP/DOWN detect switch
30 REC SAFETY switch
31 FG board
32 Leaf switch (UL switch and AL switch)
33 Drive gear
34 Loading belt
35 Mode control motor
36 Pick-up head
37 Solenoid
38 REEL SENSOR board
39 Center pulley
40 Reel belt
41 Take-up clutch belt
42 Capstan belt

2.2 PERIODIC MAINTENANCE

The following procedures are recommended for maintaining optimum performance and reliability of this video cassette recorder.

2.2.1 Cleaning

For cleaning, use a lint-free cloth or gauze dampened with alcohol.

A: Tape transport system

1. The following components should be cleaned after every 500 hours of use.
   1) Supply guide pin
   2) Tension pole
   3) Supply guide pole
   4) Full erase head
   5) Impedance roller
   6) Supply guide roller
   7) Supply slant pole (Supply pole base assembly)
   8) Video head and Drum system
   9) Upper surface of drum shaft (Lower drum assembly)
   10) Brush
   11) Take-up slant pole (Take-up pole base assembly)
   12) Take-up guide roller
   13) Audio/control head and Audio erase head
   14) Take-up guide pole
   15) Pinch roller
   16) Capstan
2. Since above parts come in direct contact with video tape, they tend to collect dust particles. If allowed to accumulate, dust may lead to damage to the video tape and above parts.
3. After cleaning with alcohol, allow the parts to dry thoroughly before using a cassette tape.

NOTE:
When cleaning the two video heads on the upper drum, do not clean them with a vertical stroke.
Use only a gentle back and forth motion in the direction of the tape path.
Use care since they are easily damaged.
When cleaning video heads, A/C head and erase heads, use a lint-free cloth dampened with alcohol.

B: Reel drive system

1. The following components should be cleaned after every 1,000 hours of use.

   – Upper section –
   17) Center pulley
   18) Reel idler
   19) Supply reel disk
   20) Supply brake
   21) Take-up reel disk
   22) Take-up brake
   23) Take-up clutch
   24) Take-up idler

   – Bottom section –
   25) Capstan motor
   26) Capstan belt
   27) Capstan flywheel
   28) Take-up clutch belt
   29) Take-up clutch
   30) Drive gear
   31) Loading belt
   32) Mode control motor
   33) Reel belt
   34) Center pulley
2. The above revolving parts are of rubber or come in direct contact with rubber parts.
   Rubber dust can accumulate and interfere with proper operation.
3. Avoid using excessive alcohol when cleaning rubber parts.

2.2.2 Lubrication

The following components should be lubricated with JVC oil after every 2,000 hours of use.

1) Shaft of the supply reel disk
2) Shaft of the take-up reel disk

After cleaning above shafts with alcohol, lubricate these shafts with one or two drops of JVC oil.
Do not over lubricate.

2.2.3 Service schedule for main components

The following chart lists the parts of the units which should receive periodic servicing at the recommended intervals. Table 2-2 indicates approximate times when replacement of critical internal parts should be considered. However, in actual usage, these times will vary greatly according to environmental and usage conditions. Routine inspection and maintenance are also important factors that influence equipment life. Note that rubber parts may become aged or deformed after long periods of storage, even if the equipment is not used.

Category	Part No.	Part Name	Periodic Service Schedule (operating hours)				
			1000	2000	3000	4000	5000
HEAD	PU31332L	Upper drum ass'y	○	●	○	●	○
	PU51262-4	Audio/control head ass'y			●		
	PU51263-2	Full erase head					●
MOTOR	PU55371V	Capstan motor		●		●	
	PU54304M	Mode control motor ass'y		●		●	
	PQ40090A	Cassette motor ass'y			●		
IDLER	PQ40134A	Pinch roller arm ass'y			●		
	PU55373	Take-up clutch		●		●	
	PU51402	Take-up idler		●		●	
	PU55374-3	Reel idler		●		●	
BELT	PUM30004	Capstan belt	○	●	○	●	○
	PUM30003-7	Reel belt		●		●	
	PUM30003	Take-up clutch belt		●		●	
	PUM30003-8	Loading belt			●		
BRAKE	PUM30019-2	Brake pad		●		●	
	PU51390A	Tension band ass'y		●		●	
REEL DISK	PU48907D	S. Reel disk ass'y			●		
	PU48907E	T. Reel disk ass'y			●		
BRUSH	PU48678A	Brush ass'y		●		●	

○ Check and replace if necessary.

● Replace.

Table 2-2 Standard service periods

NOTE:
Even if the unit is not used frequently, cleaning, lubrication and replacement of the belts should be undertaken every 2 years.

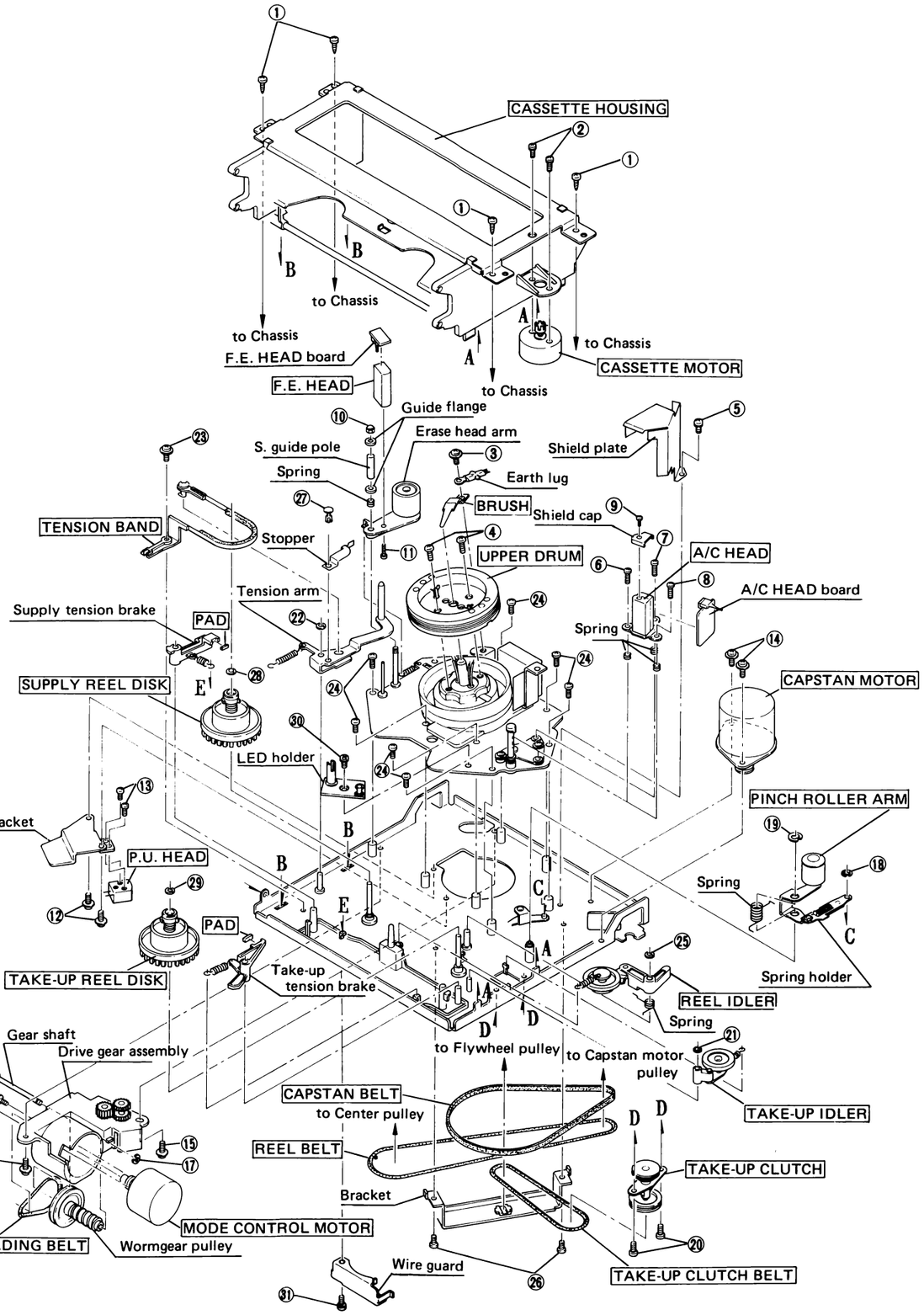


Fig. 2-3 Main assembly replacements

2.3 MAIN ASSEMBLY REPLACEMENTS

As necessary to allow replacement, remove external covers, circuit boards and shield covers. Refer to Fig. 2-3 and replace the parts according to the indicated sequence.

2.3.1 Cassette housing and cassette motor

- Cassette housing removal

1. Take out four screws (1) and disengage the connection from A/S/M board.
2. Carefully lift the cassette housing upwards to remove it.

NOTE:
For service procedures that call for operation of the set without loading of the tape about the head drum, extract the housing from the interior of the set and position it as described below.

1) Set a sheet of insulated material (cardboard, plastic, etc.) on the right side of the chassis at about the T/IF board position.
2) Remove the cassette housing from the interior of the set and place it on the insulated sheeting, but do not disengage the connection from the A/S/M board.

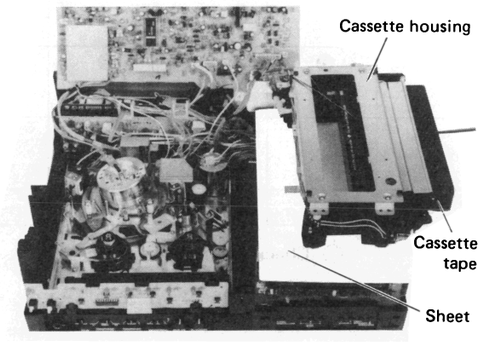


Fig. 2-4

3) Insert a cassette into the housing. The housing mechanism functions to retract the cassette.

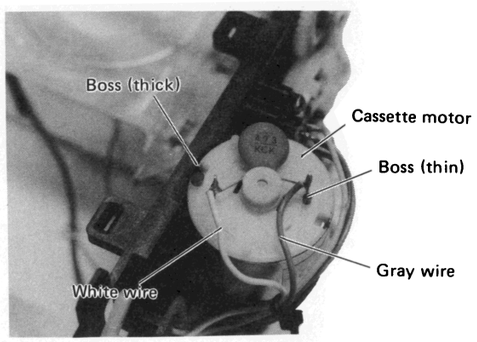


Fig. 2-5 Cassette motor wiring

4) Since the required sensors are contained within the housing, after the cassette has been retracted, the desired modes can then be set by using the operation switches.

- Cassette motor

1. Remove the cassette housing.
2. Unsolder the two wires from the cassette motor.
3. Take out two screws (2) and remove the cassette motor.
4. Replace the cassette motor and reassemble by reversing the above steps. Use care regarding the motor wires polarity (see Fig. 2-5).

2.3.2 Upper drum and brush

1. Take out screw (3) and remove the brush and earth lug.
2. Unsolder the four wires connecting the lower drum from the relay pins of upper drum (perform quickly to avoid damaging the wires) as shown in Fig. 2-6.

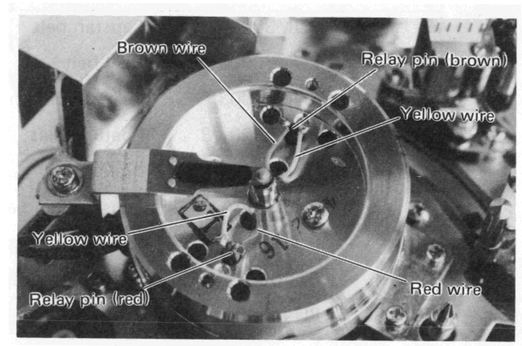


Fig. 2-6 Upper drum wiring

3. Take out two screws (4) and remove the upper drum in the upward direction.
4. Use alchol to clean the lower face of new upper drum and the upper face of lower drum. When handling and installing the new upper drum, avoid directly touching the video heads and use care not to scratch the drum.
5. Reassemble by reversing the above steps. When resoldring, observe the correct channels (brown : CH-1, red : CH-2) and avoid overheating the wires.
6. Use screw (3) to secure the brush and earth lug. Check that the brush is positioned at the center of the drum shaft.
7. Perform the following checks and adjustments.
   1) Control head phase (see section 2.5.8).
   2) P.B switching point (see section 3.4.4).
   3) Overall checks and adjustments of the video and audio circuits (see section 3.5).

2.3.3 Audio/control head

1. Take out screw (5) and remove the shield plate.
2. Take out three screws (6), (7) and (8) to remove the audio/control head. Use care regarding the coil springs.
3. Unsolder the six terminals coming from audio/control head and remove the A/C HEAD board.
4. Take out screw (9) and remove the shield cap on the audio/control head.
5. Replace the audio/control head and reassemble by reversing the above steps without shield cap installation.
6. Perform the following checks and adjustments.

A: Tape transport adjustment

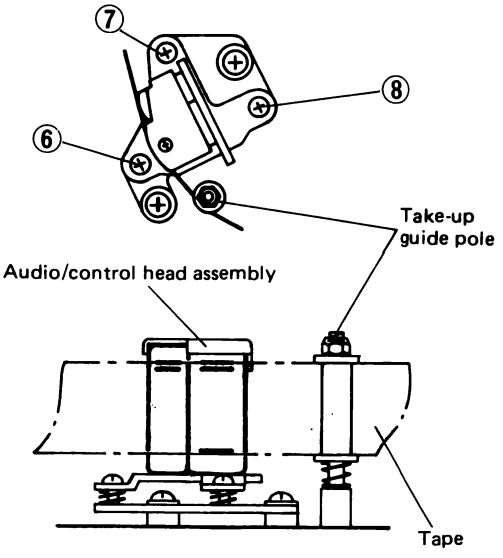


Fig. 2-7 Audio/control head adjustment

1) Employ a cassette tape (E-180) and set for PLAY mode.
2) Turn screw (8) and adjust for smooth transport at the take-up guide pole. Do not adjust the height of the take-up guide pole itself.

B: Audio/control head height and azimuth

- Incorrect audio/control head height can impair audio signal-to-noise ratio when playing back a pre-recorded tape.

1) Connect oscilloscope to CN1-3 (AUDIO OUT) of TERMINAL board.
2) Play 6 kHz segment (stairstep signal) of the alignment tape MH-2.
3) Observe the audio output signal and adjust screw (7) for maximum output level.
4) Turn screws (6), (7) and (8) in succession by small and equal increments at a time and adjust for maximum audio output level. With reference to screw (6), adjust azimuth with screw (7) and screw (8) so that small tape wrinkles are not produced at the guide pole, but at the same time, audio output becomes maximum and level fluctuations minimum.
5) Reassemble the shield cap on the audio/control head with screw (9).

C: Final checks and adjustments

1) Perform the interchangeability adjustment (see section 2.5).
2) Perform the aduio circuit adjustment (see section 3.6).

2.3.4 Full erase head

1. Unsolder the two terminals coming from the full erase head and remove the F.E. HEAD board.
2. Take out Nut (10) and remove the supply guide pole, guide flanges and coil spring.
3. Unhook the spring from the erase head arm and remove the erase head arm in the upward direction.
4. Take out screw (11) to remove the full erase head.
5. Replace the full erase head and reassemble by reversing the above steps.
6. Perform the following checks and adjustments.
   1) Supply guide pole height adjustment (see section 2.4.2-B).
   2) Interchangeability adjustment (see section 2.5).

2.3.5 Pick-up head

1. Unsolder the two wires from the pick-up head.

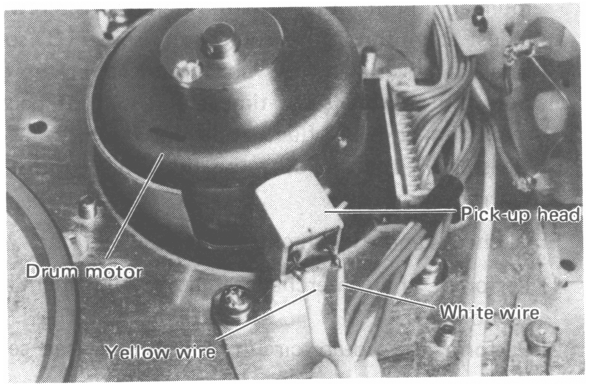


Fig. 2-8 Pick-up head wiring

2. Take out two screws (12) and remove the bracket.
3. Take out two screws (13) to remove the pick-up head.
4. Replace the pick-up head and reassemble by reversing the above steps. Tighten two screws (12) in the state with the bracket moved fully to the rotor side, but does not contact with the both magnets on the rotor.
5. Perform the P.B switching point adjustment (see section 3.3.4).

2.3.6 Capstan motor

1. From the bottom side, disengage the reel belt and capstan belt from the capstan motor pulley.
2. Disconnect the cap housing from the capstan motor and take out two screws (14) to remove the capstan motor.
3. Replace the capstan motor and reassemble by reversing the above steps. Use care regarding the capstan motor wiring (see Fig. 2-9).

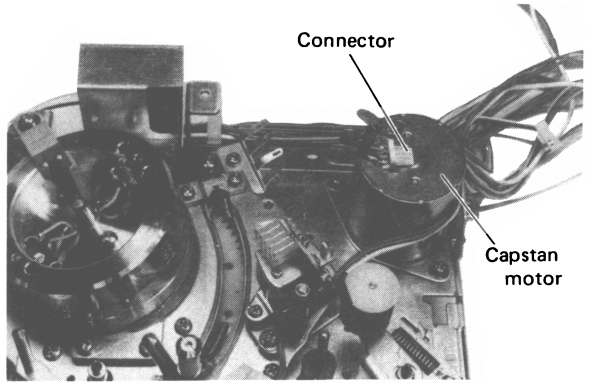


Fig. 2-9 Capstan motor wiring

4. Perform the capstan discriminator adjustment (see section 3.3.3).

2.3.7 Mode control motor and loading belt

1. Unsolder the two wires and ceramic capacitor from the mode control motor.

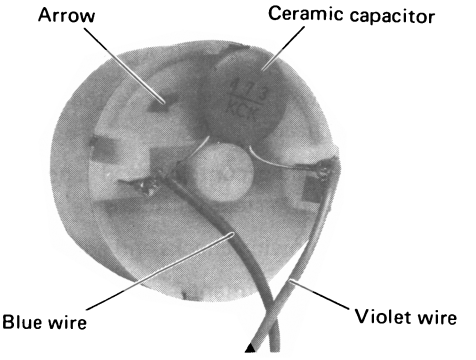


Fig. 2-10 Mode control motor wiring

2. Take out two screws (15) and remove the drive gear assembly.
3. Disengage the loading belt from the motor pulley.
4. Take out two screws (16) to remove the mode control motor.
5. Take out E-ring (17) and pull out the gear shaft to remove the wormgear pulley. Use care regarding the two washers.
6. Replace the loading belt and reassemble by reversing the step 5. If necessary, lubricate the gear shaft with JVC oil after cleaning with alchol. Do not over lubricate.
   Avoid staining the loading belt with grease or oil.
7. Replace the mode control motor and reassemble by reversing the above steps 1 to 4. Use care regarding the motor wire polarity (see Fig. 2-10).
   Perform the following steps when install the drive gear assembly.
   1) Turn the drive rings by hand from bottom side and set the supply and take-up pole bases to end of travel (loading end position as shown in Fig. 2-11).

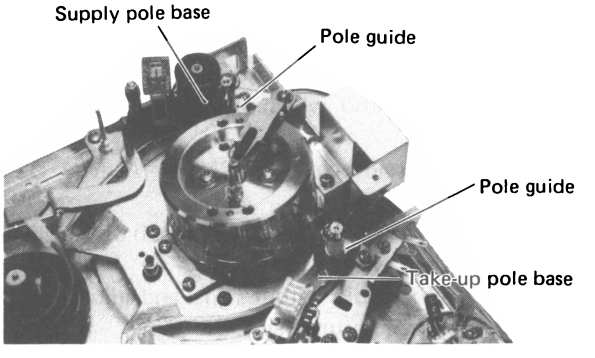


Fig. 2-11 Loading end position

   2) Install the drive gear assembly and fix with two screws (15) .

8. Turn the mode control motor pulley by hand to move the loading rings slightly in the unloading direction. Check for equal spacing between the supply pole base and the pole guide, and between the take-up pole base and the pole guide. If not equal, the drive gear assembly mounting position is incorrect. Repeat the above steps 7-7-1) and 2).

2.3.8 Pinch roller arm

1. Take out E-ring (18) and disengage the spring holder of pinch roller arm from the play lever.
2. Take out E-ring (19) to remove the pinch roller arm and torsion spring.
3. Replace the pinch roller arm and spread grease on it's parts contact with pinch roller mounting shaft.
   Avoid staining the pinch roller with grease.
4. Reassemble by reversing the above steps.

2.3.9 Take-up clutch

1. Disengage the take-up clutch belt from the take-up clutch.
2. Take out two screws (20) to remove the take-up clutch. Use care regarding the spring of the take up idler when remove the take-up clutch downwards.
3. Replace the take-up clutch and reassemble by reversing the above steps.
4. Perform the take up torque check by following steps.
   1) Set the PLAY mode without cassette housing (see section 2.3.1).
   2) Set the torque gauge on the take-up reel disk.
   3) Relax the grip on the torque gauge so that the indicator needle and scale rotate at equal speed, then read the indication. The correct value is between 60 and 100 gcm.
   4) If not the correct value, confirm the condition of the take-up idler spring and take-up clutch belt.
      If necessary, exchange the take-up clutch with another new one.

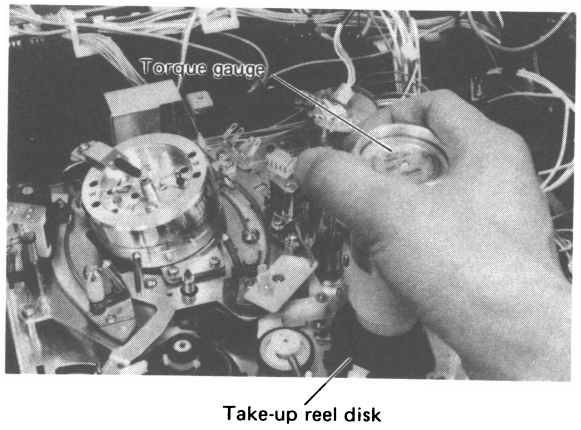


Fig. 2-12 Take-up torque check

2.3.10 Take-up idler

1. Unhook the take-up idler spring from the hook of maindeck.
2. Take out slit washer (21) to remove the take-up idler upwards.
3. Replace the take-up idler and reassemble by reversing the above steps. Use care that the take-up idler is mounted on the correct position.

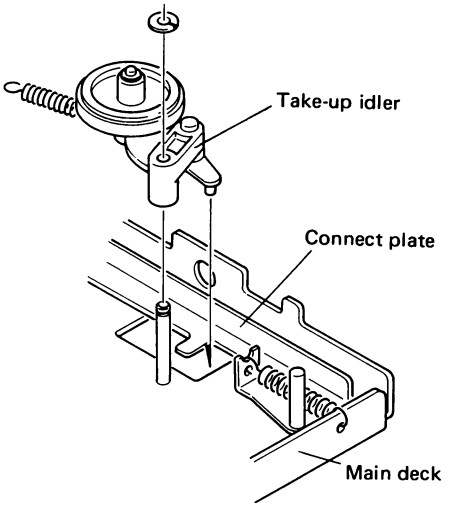


Fig. 2-13 Take up idler position

2.3.11 Reel idler

1. Take out screw (30) and remove the LED holder.
2. Turn the mode control motor pulley by hand to release the idler plate from the reel idler.
3. Unhook the reel idler spring from the hook of mold base.
4. Take out slit washer (25) to remove the reel idler upwards. Use care regarding the torsion spring under the reel idler.

5. Replace the reel idler and reassemble by reversing the above steps. Check that the torsion spring is mounted on the correct position as shown in Fig. 2-14.

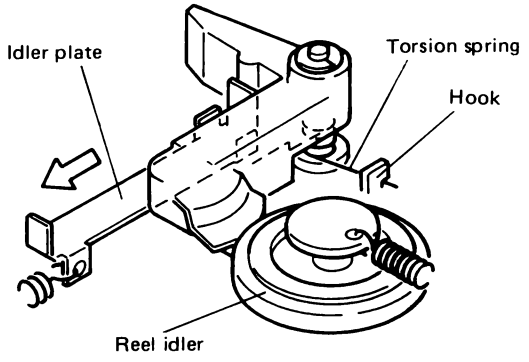


Fig. 2-14 Torsion spring position

2.3.12 Reel belt

1. Disengage the take-up clutch belt from the take-up clutch.
2. After taking out screw (31) to remove the wire guard, disengage the reel belt from the center pulley and the capstan motor pulley.
3. Replace the reel belt and reassemble by reversing the above steps.

2.3.13 Capstan belt and take-up clutch belt

1. Take out two screws (26) and remove the bracket.
2. Disengage the take-up clutch belt from the take-up clutch and the flywheel pulley.
3. Disengage the reel belt from the center pulley and the capstan motor pulley.
4. Disengage the capstan belt from the flywheel and the capstan motor pulley.
5. Replace the capstan belt and the take-up clutch belt, and reassemble by reversing the above steps.

2.3.14 Brake pads

- Take-up tension brake pad

1. Unhook the spring of take-up tension brake from the mold base.
2. Turn the take-up tension brake clockwise and remove it upwards.

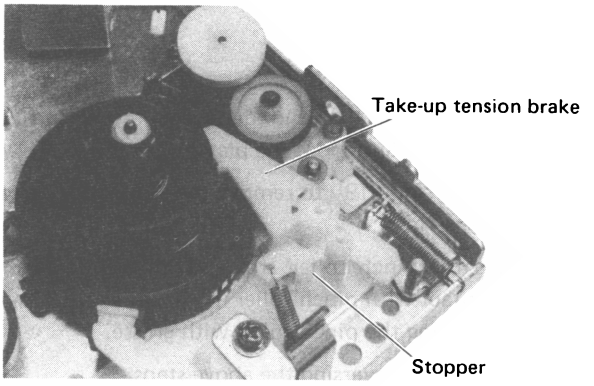


Fig. 2-15 Take-up tension brake

3. Tear off the pad from the take-up tension brake.
4. Stick the new pad on the take-up tension brake and install the take-up tension brake and its spring to the former state.

- Supply tension brake pad

5. Take out screw (23) and move the tension band aside.
6. Unhook the spring of supply tension brake from the mold base.
7. Bend the stopper of mold base and remove the supply tension brake upwards.

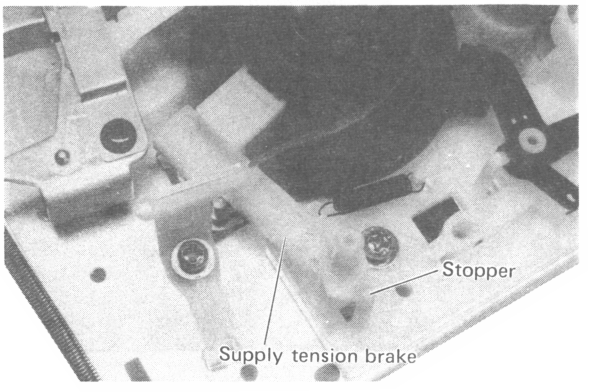


Fig. 2-16 Supply tension brake

8. Replace the pad in the same manner as the take-up pad replacement.
9. Install the supply tension brake and its spring to the former state.
10. Install the tension band and perform the tension pole position adjustment (see section 2.3.15-4).

2.3.15 Tension band

1. Take out plastic rivet (27) and remove the stopper bonded on the tension arm.
2. Take out screw (23) and move the tension band bonded on the maindeck, and unhook it from the tension arm to remove it.
3. Replace the tension band and reassemble by the reversing the above steps. Bond the stopper on the tension arm as before. If necessary, bond the tension band.
4. Perform the tension pole position adjustment by the following steps.
   - Tension pole position adjustment.

   1) Without tape, set for the PLAY mode (see section 2.3.1).
   2) Confirm that the left side of tension pole lies upon the left side of subdeck as shown in Fig. 2-17.

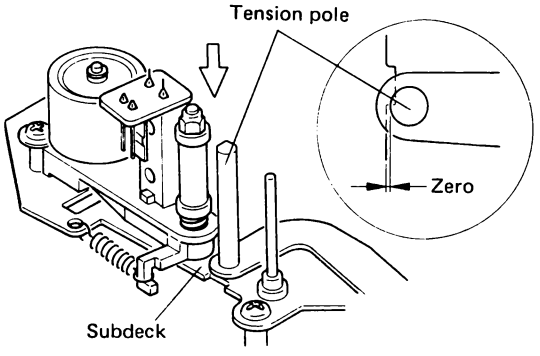


Fig. 2-17 Tension pole position

   3) If necessary, loosen screw (23) and adjust the tension band holder to obtain the correct tension pole position.

NOTE:
If back tension is incorrect, check the tension pole position. Use the back tension cassette gauge and confirm a value of between 28 and 39 gcm. If necessary, replace the tension arm spring and readjust the tension pole position.

2.3.16 Reel disks

- Supply reel disk

1. Take out slit washer (22) and screw (23), and remove the tension arm and the tension band together. Use care regarding grease on the tension arm.
2. Take out slit washer (28), and turn the supply tension brake counter-clockwise to remove the supply reel disk upwards. Use care regarding the washer and collar.
3. Lubricate the reel shaft with JVC oil after cleaning with alchol. Do not over lubricate.
4. Replace and install the supply reel disk, and perform the reel disk height check by the following steps.
   - Reel disk height check.

   1) Set the master plane jig as shown in Fig. 2-18.

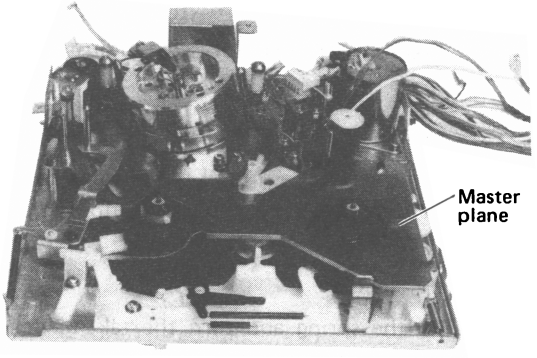
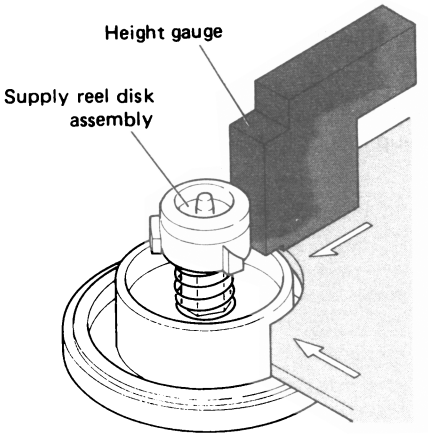


Fig. 2-18 Master plane jig setting

   2) Use the height gauge and check the reel disk height. Measure at two places 90° apart.
   3) The correct height is between planes A and B as shown in Fig. 2-19.



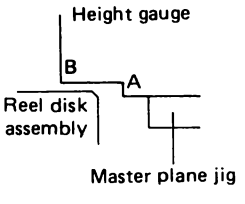


Fig. 2-19 Reel disk height check

4) If not the correct, use the height adjustment washers to obtain the correct height as shown in Fig. 2-20.

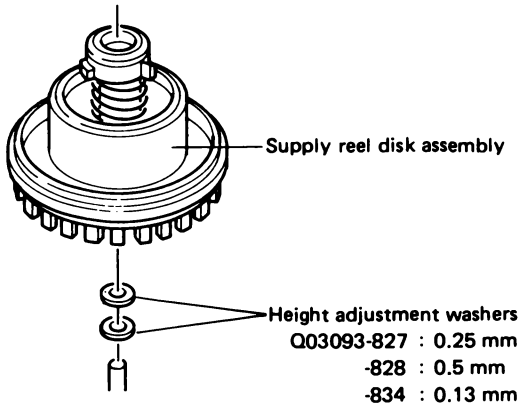


Fig. 2-20 Washers for height adjustment

5. Mount the tension arm and the tension band as before, and perform the tension pole position adjustment (see section 2.3.15-4).

- Take-up reel disk

6. Unhook the spring and turn the take-up tension brake clockwise to remove upwards (see section 2.3.14-1 and 2).
7. Take out slit washer (29) and remove the take-up reel disk upwards. Use care regarding the collar.
8. Lubricate the reel shaft with JVC oil after cleaning with alchol. Do not over lubricate.
9. Replace and install the take-up reel disk, and perform the reel disk height check in the same manner as the supply side.
10. If not the correct, exchange the collar under the take-up reel disk or take-up reel disk itself for new one.

2.4 TAPE TRANSPORT SYSTEM CHECKS AND ADJUSTMENT

The tape transport system has been precisely aligned at the factory and normally does not require readjustment. The following steps are therefore necessary only in cases of severe usage or when replacing parts affecting the tape transport system.

2.4.1 Tape transport check

Remove the shield plate (for A/C head) before tape transport check.

1. Employ a 180-minute tape and check at tape beginning and ending portion according to the following steps.
2. Operate the machine between Play and Stop modes several times.
   During Loading and Unloading, observe the tape at the supply and take-up guide rollers and guide poles.
   Confirm absence of curling, wrinkling, etc. as shown in Fig. 2-21.

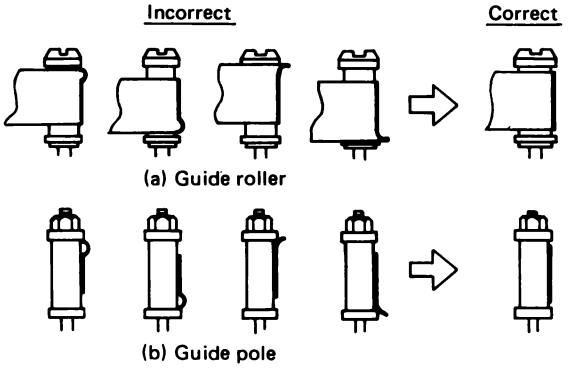


Fig. 2-21 Guide roller and guide pole

3. Observe the tape as it becomes wrapped around drum during loading and as it separates from the drum during unloading.
   Confirm absence of damage to the tape at points (A) and (B) as shown in Fig. 2-22 and absence of contact noise between head tips and tape edge.

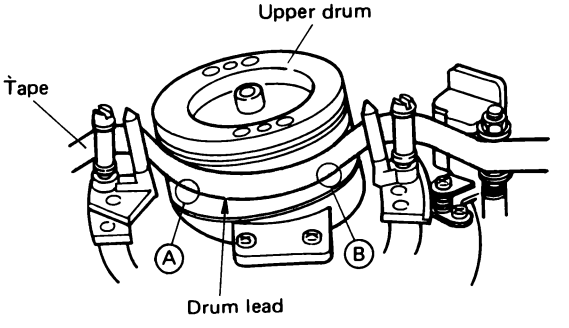


Fig. 2-22 Drum lead check-1

NOTES:

1. Slips upward : sound becomes produced by contact between tips of rotating heads and edge of tape.
2. Slips downward : tape curls or wrinkles from contacting lead face (sound may also be produced).

4. During Play mode, observe tape at the input and output portions (Ⓒ and Ⓓ in Fig. 2-23) of the head drum lead.
   Confirm that the tape slips neither upward nor downward with respect to the lead as shown in Fig. 2-24.

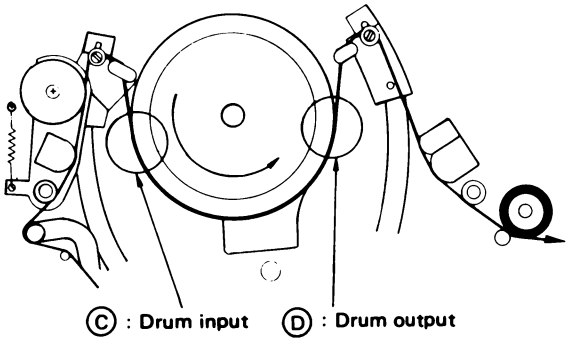


Fig. 2-23 Tape transport check

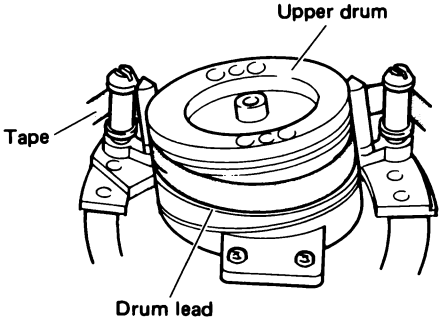


Fig. 2-24 Drum lead check - 2

5. During Play mode, observe the tape at the take-up and supply guide poles and guide rollers.
   Confirm absence of curling, wrinkling, etc. as shown in Fig. 2-21.
6. If defects are noted the above checks, perform the following adjustments.

2.4.2 Tope transport adjustments

Perform only if defects are noted during tape transport check (2.4.1).

A: Guide roller height adjustment

1. Slightly loosen setscrews of the supply and take-up guide rollers as shown in Fig. 2-25.
2. Use a cassette tape and set for Play mode.
3. With a slotted screwdriver, slightly turn the supply guide roller (do not turn more than 180° at a time) and adjust so that at the drum input, the tape travels smoothly in the drum lead without slipping upwards or downwards.
4. Similarly, adjust the take-up guide roller for the drum output.

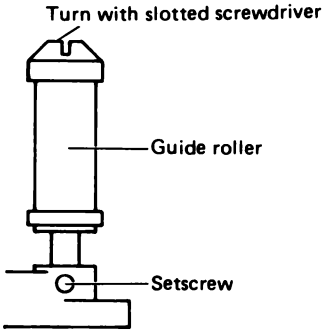


Fig. 2-25 Guide roller height adjustment

NOTES:

1. Loosen the setscrews only enough to allow the guide rollers to be turned.
   If excessively loose, tape motion may turn the rollers inadvertently.
2. Turn the rollers carefully to avoid damage to the tape.

B: Guide pole height adjustment

Remove the guide pole cap before take-up guide pole height adjustment.

(a) Guide pole height check

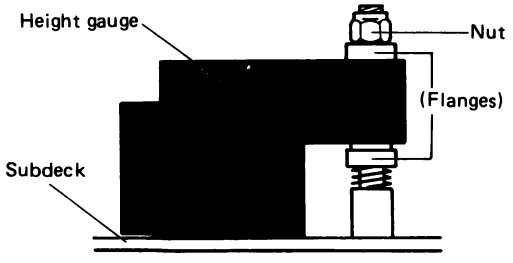


Fig. 2-26 Guide pole height adjustment

1. Set the height gauge on the subdeck as shown in Fig. 2-26.
2. For each guide pole, check the height of the lower face of the upper flange. If necessary, carefully adjust by turning the nut.
   After adjusting the height using the height gauge, turn the supply side nut 50° counter-clockwise and the take-up side nut 160° clockwise. This will provide the required slight difference in height between the supply and take-up guide poles.
3. If guide pole height has been adjusted, following checks and adjustments are required.

(b) Supply guide pole height adjustment

1. Use a cassette tape and set for Play mode.
2. Use a metric nutdriver to turn the supply guide pole to align the upper flange of the guide pole with the upper edge of the tape as shown by (b) of Fig. 2-21. However, this adjustment must be performed so tht at the same time, the upper flange remains within ±0.5 mm of the height adjusting jig portion shown in Fig. 2-26.

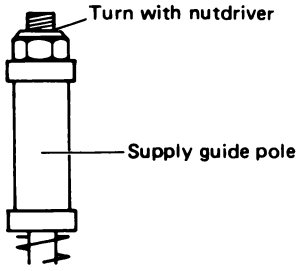


Fig. 2-27 Supply guide pole height adjustment

3. **If there is a large descrepancy, check the height of the supply reel disk, tension pole and other mechanical components.**

C: Audio/Control head adjustment

1. Employ a cassette tape and set for Play mode.
2. Turn audio/control head screw Ⓒ as shown in Fig. 2-28 and adjust for smooth transport at the take-up guide pole as shown by (b) of Fig. 2-21.

NOTE: Do not adjust the height of the take-up guide pole itself.

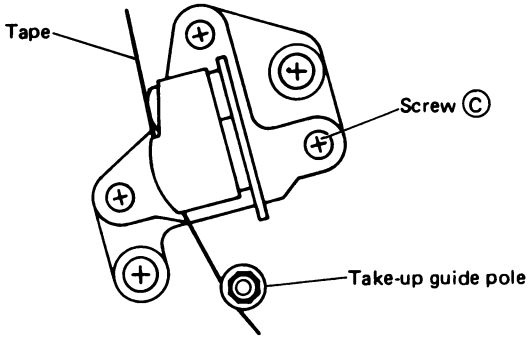


Fig. 2-28 Take-up guide pole

2.5 INTERCHANGEABILITY ADJUSTMENT

Before using alignment tape, employ a tape and confirm correct tape transport.

2.5.1 Preliminary checks

A: Check sequence 1

1. Connect oscilloscope to TP-106 of the VIDEO board. At this time, trigger the oscilloscope externally with the signal (25 Hz square wave) from TP-411 (DRUM F.F) of the VIDEO board.
2. Play Stairstep portion of the alignment tape MH-2.
3. Turn the Tracking control and adjust for maximum FM output at TP-106.
   Set the Tracking control to AUTO (center click position) and confirm that nearly maximum output is obtained.

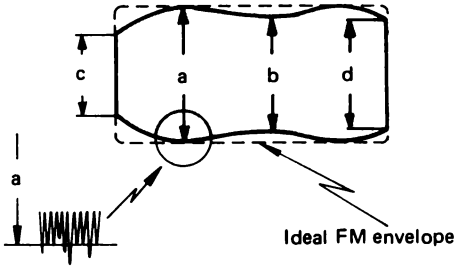


Fig. 2-29 FM waveform (max. output)

4. **Refer to Fig. 2-29. Read the level of portion (a) of the waveform. If the waveform is serrated at point (a), read the value at the most uniform serrations as shown at left in Fig. 2-29.**
5. **Read the maximum FM level (a) and minimum FM level (b), and confirm that:**

$$\frac{b}{a} \geqq 0.7 \text{ or } 20 \log \frac{b}{a} \geqq -3 \text{ dB}$$

6. **Read the values at points (c) and (d) [drum input and output] and confirm that:**

$$\frac{c}{a} \geqq 0.5 \text{ and } \frac{d}{a} \geqq 0.5 \ (\geqq -6 \text{ dB})$$

NOTES:

1. **Read minimum levels for (b), (c) and (d).**
2. **If above checks yield normal results, proceed to section 2.5.1 - B.**
3. **If defects are noted, perform adjustments of section 2.5.2.**

B: Check sequence 2

1. Observe the FM waveform as in the previous section (2.5.1 - A) and turn the Tracking control.
   The waveform variation should be nearly parallel as shown in Fig. 2-30.

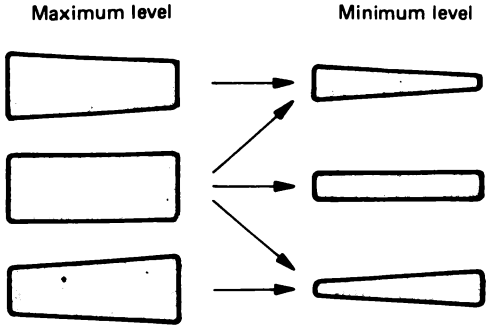


Fig. 2-30 Normal waveform examples

2. If the waveform varies as shown in Fig. 2-31, adjustment becomes required.

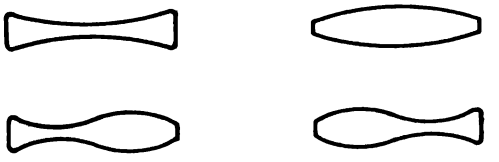


Fig. 2-31 Incorrect waveform examples

2.5.2 Preliminary adjustments

1. Loosen the setscrews of the supply guide roller and take-up guide roller.
   If the guide rollers turn freely, slightly tighten the set-screws.
2. Connect oscilloscope to TP-106 of the VIDEO board. Trigger the oscilloscope externally with the signal from TP-411 (DRUM F.F) of the VIDEO board.
3. Play the alignment tape (stairstep signal) MH-2.

A: Drum input

1. Observe oscilloscope display and adjust the Tracking control for maximum FM output.
2. Refer to Fig. 2-32. Examples of incorrect waveforms are shown by A.
   Use a slotted screwdriver to adjust the supply guide roller so that the rising portion (drum input portion) of the waveform becomes flat as shown by B.

NOTES:

1. If the guide roller turns freely, tighten the setscrew slightly.
2. Be sure to adjust the guide roller only by small amounts at a time in order to avoid damaging the alignment tape.

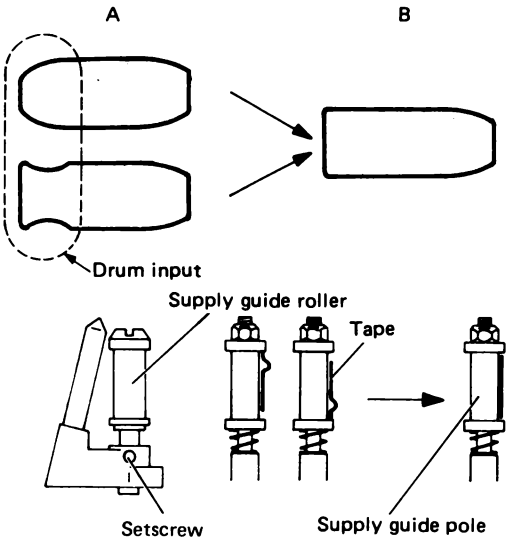


Fig. 2-32 Drum input adjustment

In addition to observing the waveform, confirm absence of tape slippage or curling at the drum lead and guide poles.

3. At the supply guide pole, if the tape separates from the guide or wrinkling occurs, adjust the guide pole height.

B: Drum output

1. In the same manner as for the drum input, turn the take-up guide roller to adjust the falling portion (drum output portion) of the FM waveform.
   Incorrect examples are shown by C in Fig. 2-33, while D indicates the correct adjustment.
2. If the tape separates from the guide or wrinkling occurs at the take-up guide pole, adjust by turning screw Ⓒ of the audio/control head as shown in Fig. 2-33.

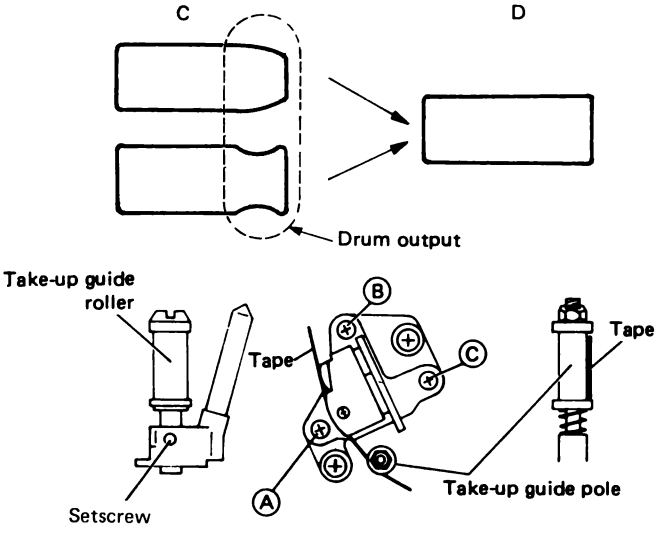


Fig. 2-33 Drum output adjustment

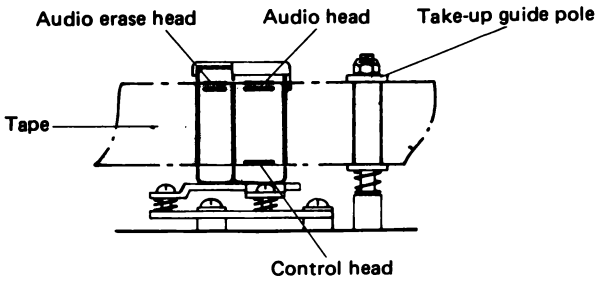


Fig. 2-34 Audio/Control head height

3. Carefully and evenly adjust screws Ⓐ, Ⓑ and Ⓒ to align the audio/control head height with the tape as shown in Fig. 2-34.

NOTES:

1. Fine adjustment is not required at this time.
   It is sufficient that the tape is engaged with the guide pole and servo operates stably (control signal picked up).
2. If the tape separates from the take-up guide pole or wrinkling occurs, screw Ⓒ (Fig. 2-33) has been turned excessively with respect to screws Ⓐ and Ⓑ, causing the audio/control head to incline forward or rearward. Use care to adjust screws Ⓐ, Ⓑ and Ⓒ evenly and observe that small wrinkles are not produced at the take-up guide pole.
3. Do not disturb the take-up guide pole.

2.5.3 Interchangeability fine adjustment

1. Connect oscilloscope to TP-106 of the VIDEO board. Play stairstep segment of the alignment tape MH-2. Observe the FM waveform and adjust the Tracking control for minimum FM output level.

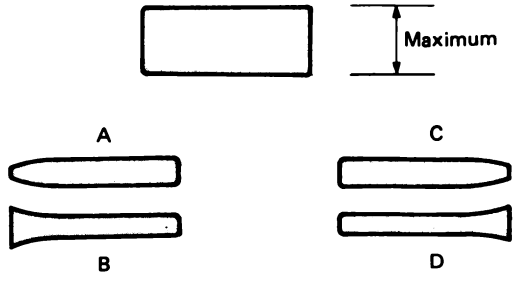


Fig. 2-35 Minimum FM output (incorrect examples)

2. If the waveform becomes as shown by A or B of Fig. 2-35, carefully adjust the supply guide roller height so that the waveform becomes as shown by E, F or G of Fig. 2-36.
   At this time, if the waveform fluctuates, adjust to the point of minimum fluctuation.

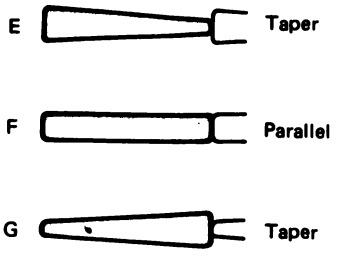


Fig. 2-36 Minimum FM output (correct examples)

3. If the FM waveform appears as shown by C or D in Fig. 2-35, carefully adjust the take-up guide roller height to obtain a waveform such as shown by E, F or G of Fig. 2-36.
   At this time, if the waveform fluctuates, adjust to the point minimum fluctuation.
4. Vary the Tracking control from maximum to minimum FM output.
   Perform fine adjustment of supply and take-up guide rollers so that waveform variation becomes as shown by E, F or G of Fig. 2-36.

2.5.4 Audio/Control head height, azimuth and inclination

See section 2.3.3 Audio/Control head height and azimuth.

2.5.5 Setscrew tightening

1. Check for maximum FM output waveform, maximum audio out and absence of tape wrinkling or other transport irregularities, then secure the guide rollers.
   Perform in Stop mode.
2. Since the guide rollers are easily moved, use care when securing.
3. After tightening the setscrews, again perform interchangeability final check.

2.5.6 Interchangeability final check

Confirm section 2.5.1 Preliminary checks.

2.5.7 Servo circuit adjustment

1. Video head switching position (see section 3.3.4).

2.5.8 Control head phase adjustment

1. Connect oscilloscope to TP-106 of the VIDEO board. Trigger the oscilloscope externally with the signal from TP-411 (DRUM F.F) of the VIDEO board.
2. Play stairstep portion of the alignment tape MH-2 and observe the oscilloscope display.
3. Set the Tracking control to AUTO (center click position).

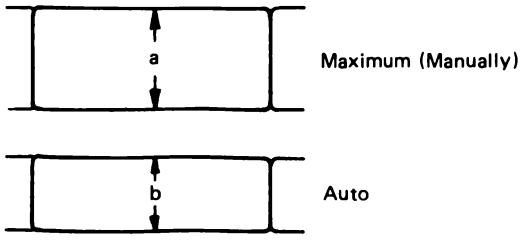


Fig. 2-37 FM output level

4. Confirm that the level difference between this setting and the maximum level obtained manually is:

$$-20 \log \frac{b}{a} \leqq 1 \text{ dB or } \frac{b}{a} \geqq 0.9$$

5. If necessary, adjust as follows.
6. Set the Tracking control to AUTO and play stairstep segment of the alignment tape MH-2.
7. Loosen two screws Ⓓ and Ⓔ and slide the A/C head assembly fully in the direction to the take-up guide pole.

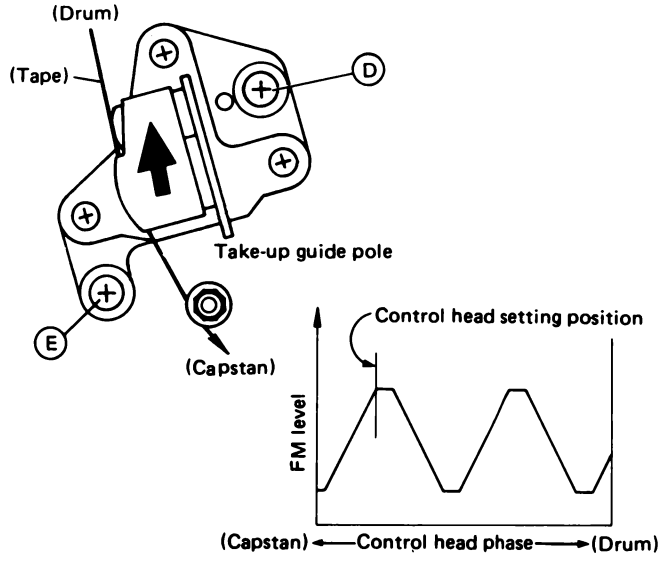


Fig. 2-38 Control head phase adjustment

8. Slightly tighten the two screws and play stairstep segment of the alignment tape MH-2.
9. Set the audio/control head position tool (PUJ47351-2) over the screw Ⓓ and insert the pin of the tool into the hole at the side of the screw.
10. Slowly turn the tool and slide the A/C head assembly in the direction of the arrow as shown in Fig. 2-38.
11. Set the A/C head assembly to the position where first maximum FM level is obtained. Tighten two screws Ⓓ and Ⓔ.

2.5.9 Final checks (recording and playback)

1. Use a blank tape and perform recording and playback. Confirm FM waveform and specifications equivalent to those during playback of alignment tape (stairstep signal). See section 2.5.1.
2. Perform checks and adjustments of the audio recording and playback levels. See section 3.6 Audio circuit.
3. Check other signal systems by referring to section 3 electrical adjustment.

SECTION 3
ELECTRICAL ADJUSTMENTS

3.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts. It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

3.1.1 Required test equipment and jig

1. Color TV Monitor
2. Oscilloscope: Wideband
3. Signal generator: Color bar, Stairstep
4. Audio generator
5. Frequency counter
6. Digital voltmeter
7. Alignment tape (MH-2)
8. Regulated DC power supply (5A)

3.1.2 JVC alignment tape contents

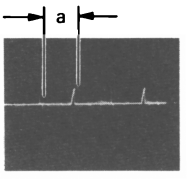
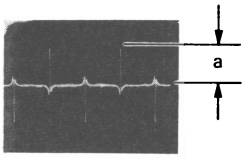
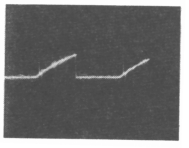
MH-2 contents

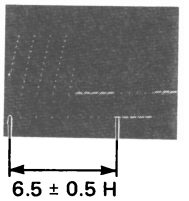
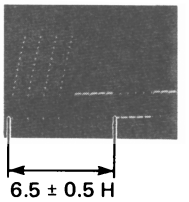
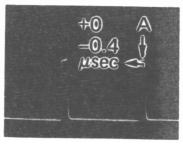
Segment	Playback Time	Video Signal	Audio Signal	Applications
1	10 minutes	Stairstep	6 kHz	• Interchangeability checks and adjustments • Servo circuit checks and adjustments • Audio head azimuth adjustments
2	5 minutes	(none)	3 kHz	• Tape speed checks • Wow and flutter checks
3	10 minutes	Color bar	1 kHz 0dB	• Video signal playback circuit checks and adjustments • Audio signal playback circuit checks and adjustments
4	3 minutes	RF sweep	(none)	• Video head resonance checks Marker: 2 MHz, 4 MHz, 5 MHz

3.2 REGULATOR CIRCUIT

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	9.3 V DC Output Voltage	TP2 (SW 9 V) TP3(GND)	R8 (9.3 V ADJ)	REC	1. Connect the digital voltmeter between TP2 and TP3. 2. Adjust R8 for 9.3 ± 0.1 V.

3.3 SERVO CIRCUIT

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Drum Discriminator	TP407 (DRUM S.P. POS.) TP423 (DRUM P/D ERROR)	R463 (DRUM DISCRI)	MH-2 Color bar PB.	1. Connect an oscilloscope to TP407 of the A/S/M.CTL board. 2. Trigger the oscilloscope externally with the signal from TP411 (DRUM FF.) of the A/S/M.CTL board. 3. Play the alignment tape (color bar). 4. Adjust R463 so that period "a" becomes fixed and stable. 5. Connect the digital voltmeter to TP423 of the 6. Adjust R463 for 4.6 ± 0.1 V.  TP 407 Drum sampling position
2	Drum Pick Up Pulse Level	TP406 (DRUM PU PULSE)	R459 (D. PU PULSE LEV.)	MH-2 Color bar PB.	1. Connect an oscilloscope to TP406 of the A/S/M.CTL board. 2. Play the alignment tape (color bar). 3. After drum servo is locked, adjust R459 for a=1.0 ± 0.1 V.  TP 406 Drum PU pulse level
3	Capstan Discriminator	TP403 (CAP. S.P. POS.) TP422 (CAP. P/D ERROR)	R403 (CAP. DISCRI)	Color bar or TV signal REC	1. Connect an oscilloscope to TP403 of the A/S/M.CTL board. 2. Record a color bar signal. 3. Adjust R403 so that the waveform becomes fixed and stable. 4. Connect the digital voltmeter to TP422 of the A/S/M.CTL board. 5. Adjust R403 for 4.6 ± 0.1 V.  TP 403 Capstan sampling position

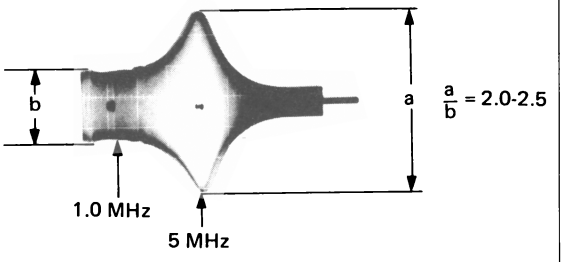
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
4	PB. Switching Point	√VIDEO OUT or TP510 (VIDEO OUT)	R450 (CH-1 SW PHASE) R448 (CH-2 SW PHASE)	MH-2 Stairstep PB.	1. Connect an oscilloscope to VIDEO OUT or TP510 of the VIDEO board. 2. Play the alignment tape (stairstep). 3. Trigger the oscilloscope externally (-slope) with the signal from TP411 of the A/S/M.CTL board. 4. Adjust R450 to position the trigger point 6.5 ± 0.5 H from V. sync. 5. Trigger the oscilloscope externally (+slope) with the signal from TP411. 6. Adjust R448 to position the trigger point 6.5 ± 0.5 H from V. sync.  CH-1 PB switching point  CH-2 PB switching point
5	V. Pulse Position	TV Screen	R446 (V. P POSITION)	MH-2 Color bar PB.	1. Set for the STILL playback mode. 2. Observe the picture display and adjust R446 for minimum vertical jitter.
6	H. Discriminator	TP412 (SYNC)	R461 (H. DISCRI)	Color bar REC ↓ PB.	1. Connect an oscilloscope to TP412. 2. Supply a color bar signal, record then playback. 3. Set the trigger slope to pulse (+) and synchronize the oscilloscope with the rising component of the waveform. 4. Set the front porch (point A) of the waveform to the center of the oscilloscope display, expand the waveform X5 (five time) and again center point A. 5. In the search FF/REW mode, adjust R461 to position the front porch of the H sync waveform at point A (with in $^{+0}_{-0.4}$ μsec).  TP 412 SYNC

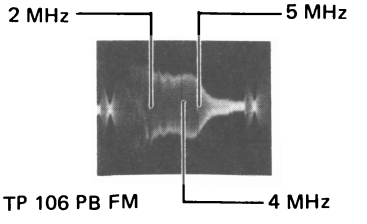
3.4 MECHACON CIRCUIT

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Still Noise	TV Screen	R271 (STILL NOISE)	Color bar REC ↓ PB.	1. Set the Tracking VR to the center click position. 2. Supply a color bar signal, record, then playback. 3. In the STILL mode, adjust R271 to position the noise bars at the lower 1/6th of the picture. 4. Repeat the playback and the Still mode. 5. Adjust R271 to obtain the best picture on the TV screen.

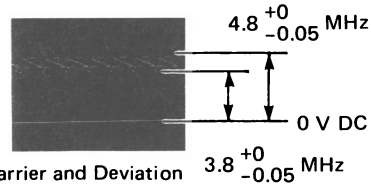
3.5 VIDEO CIRCUIT

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Video Head Resonance, Q (Quality FM Equalizer	Note: This adjustment is generally unnecessary except when replacing the upper drum assembly.			1. Apply the sweep signal from a video sweep generator to TP123 of the VIDEO board. 2. Without inserting tape, set for the Play mode. Then adjust the sweep gain so that the waveform does not distort at TP106. 3. At TP106 adjust C186 for maximum level at the 5.0 MHz marker position.
	A. Factory Service	TP123 (CH-1 REC OUT) TP106 (PB FM)	CH-1 C186 (CH-1 f_0) R200 (CH-1 Q)	RF Sweep PB.	4. Adjust R200 so that the 5.0 MHz level becomes 2.5 times the 1.0 MHz.
		TP124 (CH-2 REC OUT) TP106 (PB FM)	CH-2 C187 (CH-2 f_0) R201 (CH-2 Q)		5. In the same manner, adjust C187 and R201 for CH-2.
	B. Non-factory Service	TP106 (PB FM)	CH-1 C186 (CH-1 f_0) R200 (CH-1 Q)	MH-2 RF Sweep PB.	Note: The MH-2 marker appears at 2.0 MHz, 4.0 MHz and 5.0 MHz. 1. Trigger the oscilloscope externally with the signal from TP411 of the VIDEO board. 2. Play the alignment tape (RF Sweep Signal). 3. Use (-) trigger for CH-1 and (+) trigger for CH-2.
			CH-2 C187 (CH-2 f_0) R201 (CH-2 Q)		4. Turn R200 fully clockwise and R201 fully counterclockwise not to damp. 5. Adjust C186 to set the CH-1 resonance point to 5.0 MHz and C187 to set the CH-2 resonance point to 5.0 MHz. 6. If the levels of CH-1 and CH-2 differ, adjust the higher level channel to match the lower by R200 and R201.
				TV Signal REC ↓ PB.	7. Record a Video signal, then play back. Confirm absence of flicker and black-white reversal in the reproduced picture. If necessary, carefully re-adjust R200 and R201.



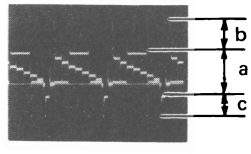


No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
2	Carrier and Deviation	IC103 pin 18		Color bar REC	1. Supply a color bar input signal. 2. Connect an oscilloscope to IC103 pin 18 and precisely measure the DC potential of the sync tip. Make a note of this as voltage "A". 3. Connect a DC power supply between IC103 pin 18 and ground. 4. Without an input signal, set for the REC mode and precisely apply sync tip bias "A" as observed with the oscilloscope. 5. Connect a frequency counter to TP106 of the VIDEO board. 6. Adjust R253 to obtain 3.8 $^{+0}_{-0.05}$ MHz. 7. Carefully adjust the DC power supply to obtain 4.8 MHz $\pm^{0}_{0.05}$ MHz at TP106. 8. Precisely read the voltage of IC103 pin 18 with the oscilloscope. Make a note of this as voltage "B". 9. Disconnect the DC power supply. 10. Supply a color input signal. 11. Adjust R179 so that the peak white at IC103 pin 18 becomes equal to voltage "B".
	Note: Before adjustment, turn R186 (WHITE CLIP) and R190 (DARK CLIP) fully counterclockwise.				
		TP106 (PB FM)	R253 (CARRIER)		
	Note: These adjustments are generally unnecessary except when replacing IC102 or IC103.				
			R179 (DEVIATION)		
3	White and Dark Clip	TP103 (W/D CLIP OUT)	R186 (WHITE CLIP) R190 (DARK CLIP)	Color bar REC	1. Supply a color bar signal input. 2. Connect an oscilloscope to TP103 of the VIDEO board. 3. As shown in the figure, adjust R186 and R190.
4	E-E Video Level	VIDEO OUT or TP510 (VIDEO OUT)	R168 (E-E LEVEL)	Color bar E-E (STOP)	1. Supply a color bar input signal. 2. With load at 75 Ω, connect an oscilloscope to VIDEO OUT or TP510. 3. Adjust R168 for 0.95 ± 0.02 Vp-p.

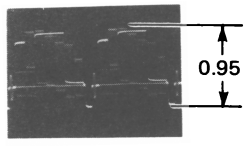


Carrier and Deviation

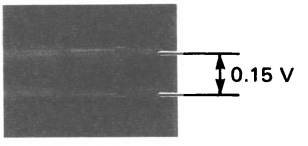
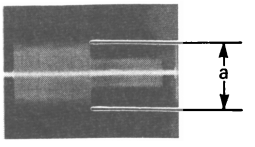
White clip
a : b = 1 : 0.8 ± 0.02
Dark clip
a : c = 1 : 0.4 ± 0.05 0

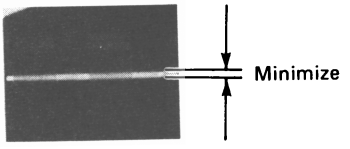
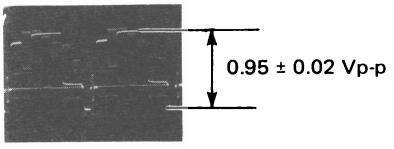
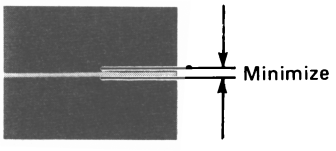


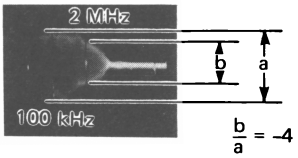
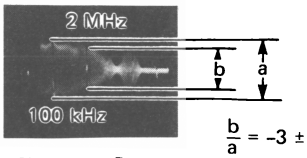
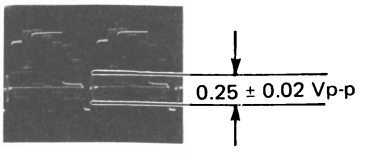
TP 103 White and Dark clip



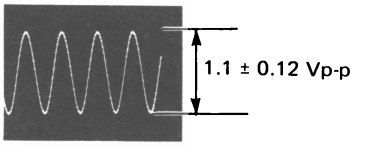
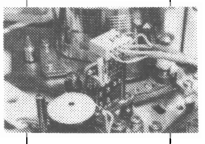
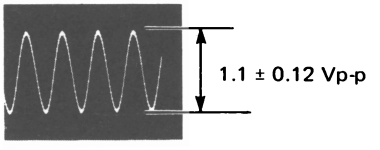
E-E Video level

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
5	AFC 625 kHz	TP403 (VCO) TP421 (SW 9 V) TP412 (SUB CONV. OUT)	R427 (AFC)	Color bar REC	1. Supply a color bar input signal. 2. Connect a 470 Ω resistor between TP403 and TP421 of the VIDEO board. 3. Connect a frequency counter to TP412. 4. Adjust R427 to obtain 623 ± 2 kHz.
6	REC FM Level	TP122 (REC CUR-RENT)	R213 (REC FM LEVEL)	Color bar REC	1. Supply a color bar input signal. 2. Connect an oscilloscope to TP122 of the VIDEO board. 3. Adjust R213 so that the pedestal level of the vertical blanking component becomes 0.15 Vp-p.  TP 122 REC Current
7	VXO (4.43 MHz)	TP406 (VXO)	R437 (VXO(2))	MH-2 Color bar PB.	1. Connect a frequency counter to TP406 of the VIDEO board. 2. Play the Alignment tape (color bar). 3. Adjust R437 for 4.433619 MHz ± 50 Hz.
8	REC Color Level	TP404 (PB COLOR)	R411 (REC COLOR)	MH-2 Color bar REC ↓ PB.	1. Connect an oscilloscope to TP404 of the VIDEO board. 2. Play the alignment tape (color bar), then measure the color level (CH-1). Make a note of this as level "a". 3. Supply a color bar signal, record, then play-back. 4. Adjust R411 so that the color level becomes 110 ± 5% of the level "a".  TP 404 PB color

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
9	Converter Balance	TP423 (CONV. BAL.)	R446 (CONV. BAL.)	Color bar REC ↓ PB.	1. Connect an oscilloscope to TP423 of the VIDEO board. 2. Supply a color bar signal, record, then play-back. 3. Adjust R446 for minimum leakage of the 5.06 MHz component.  TP 423 Conv. Bal
10	PB Y Level	VIDEO OUT or TP510 (VIDEO OUT)	R124 (PB Y LEVEL)	Color bar REC ↓ PB.	1. With load at 75 Ω connect an oscilloscope to VIDEO OUT. 2. Supply a color bar signal, record, then play-back. 3. Adjust R124 for 0.95 ± 0.02 Vp-p.  PB Y level
11	Noise Cancel	TP125 (PEAK-ING)	R109 (NOISE CANCEL)	Color bar REC ↓ PB.	1. Connect a 0.022 μF capacitor between TP125 and TP-GND. 2. Connect an oscilloscope to TP125 of the VIDEO board. 3. Supply a color bar signal, record then playback. 4. Adjust R109 to minimize the output level at TP125.  TP 125 Peaking

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
12	RF EQ	TP126 (PB Y)	R200 (CH-1 Q) or R201 (CH-2 Q) R145 (RF EQ)	Video sweep REC ↓ PB.	1. Connect an oscilloscope to TP126 of the VIDEO board. 2. Set the MODE SELECT switch of the terminal to B/W. 3. Supply a video sweep (with sync) signal, record, then playback. 4. At TP126, measure the 2 MHz levels for CH-1 and CH-2 outputs. 5. If the difference of channel level is more than 1 dB, adjust of the Q control (R200 or R201) of the lower level channel to equalize the levels both channels. 6. Set the Sharpness control to the center click position. 7. Adjust R145 so that the 2 MHz level becomes -4 ± 1 dB (56~70%) with reference to 100 kHz.  $\frac{b}{a}$ = -4 ± 1 dB (56~70%) RF EQ
13	Sharpness Preset	TP510 (VIDEO OUT)	R162 (SHARP-NESS PRESET)	Video sweep REC ↓ PB.	1. Connect an oscilloscope to TP510 of the VIDEO board. 2. Set the Sharpness control to the center click position. 3. Record and play back a video sweep (with sync) signal. 4. Adjust R162 so that the 2 MHz level becomes -3 ± 1 dB (63~79%) with reference to 100 kHz.  $\frac{b}{a}$ = -3 ± 1 dB (63~79%) Sharpness Preset
14	PB. Color Level	VIDEO OUT	R452 (PB COLOR LEVEL)	Color bar REC ↓ PB.	1. With load at 75 Ω and connect an oscilloscope to VIDEO OUT. 2. Record and play back a color bar signal. 3. Adjust R452 for a burst level of 0.25 ± 0.02 Vp-p.  P. B Color level
15	Secam Detector	TP410 (1/2 Fh Tuning	R470 (SECAM DET.)	Secam color bar REC ↓ PB.	1. Connect an oscilloscope to TP410 of the VIDEO board. 2. Record and play back a Secam color bar signal. 3. Adjust R470 for 6 ± 0.5 Vp-p (H-rate).

3.6 AUDIO CIRCUIT (MONO)

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Audio PB. Level	Audio Line Out	R6 (PB LEVEL)	MH-2 1 kHz PB.	1. Connect an oscilloscope to AUDIO OUT. 2. Play the alignment tape (Audio 1 kHz signal). 3. Adjust R6 for -6 ± 1 dBs (1.1 ± 0.12 Vp-p) at AUDIO OUT.  Audio line out
2	Audio Bias Level	R1 (CN1) 	R30 (BIAS CURRENT)	REC	1. Connect a digital voltmeter to both end of R1 (CN1) of the A/C Head board. 2. Set for the REC mode without signal. 3. Adjust R30 for 1.2 ± 0.1 mV.
3	Audio REC Level	Audio Line Out	R18 (REC LEVEL)	-20 dBs/1 kHz REC ↓ PB.	1. Connect an oscilloscope to AUDIO OUT. 2. Record and play back a video signal and an audio signal. 3. During recording adjust R18 so that the audio output level during piayback becomes -6 ± 1 dBs (1.1 ± 0.12 Vp-p).  Audio line out

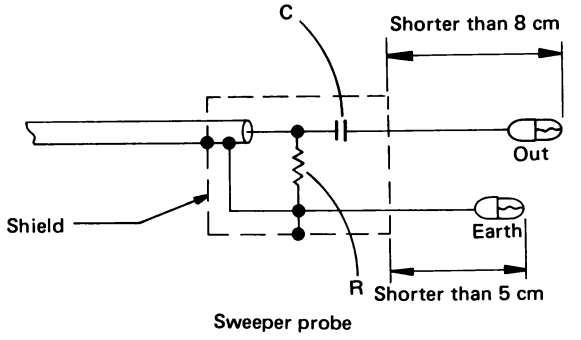
3.7 TUNER/IF CIRCUIT

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description

Unless otherwise indicated, all test points and adjustments are located on the TUNER/IF board.

Equipment required

1. Oscilloscope
2. IF sweep signal generator with suitable markers (PIF, SIF, etc.)
3. DC power supplies – For power bias (12.0 V)
   – For IF AGC bias (approx. 5 V variable)
4. Sweeper probe (sweep signal supply cable) as shown below.



Sweeper probe

	Ⓐ	Ⓑ
C pF	1000	1
R ohms	75	75

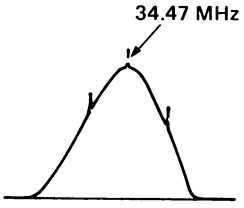
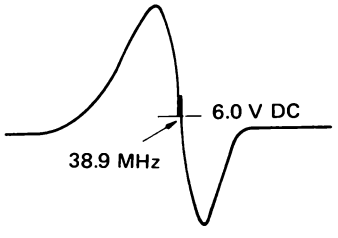
PREPARATION

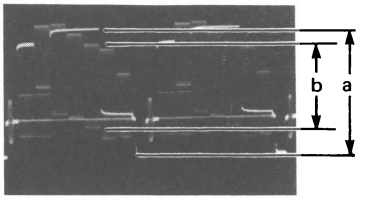
a. Remove the TUNER/IF board. (Disengage the connectors from TUNER/IF board.)
b. Apply Power bias 12.5 V DC between CN4-1 and CN4-2 (GND).
c. Apply Power bias as shown below.

CN1	1	When receiving band I (VL), apply 12 V DC. Otherwise open.
	2	When receiving band III (VH), apply 12 V DC. Otherwise open.
	3	When receiving band U, apply 12 V DC. Otherwise open.
	4	GND
	5	Tuning bias (0.3 ~ 28 V)
	6	GND
	7	(Mute drive)
	8	OPEN: AFC ON, GND: AFC OFF
	9	OPEN
	10	OPEN

Note: CN2 and CN3 are not connected.

1	LLD Coil	TP2 (V. DET. OUT)	T3 (LLD)	Sweep generator (38.9 MHz)	1. Connect the sweep generator out Ⓐ (sweeper probe Ⓐ) to pin 9 of IC1 (M51316P). 2. Adjust the sweep gain so that the waveform does not distort as observed with the oscilloscope. (approx 25mVrms) Connect a DC power supply to TP1 (AGC) Adjust AGC bias for 1 V-p-p at TP2 (V. DET OUT). 3. Adjust T3 (LLD coil) so that video IF carrier 38.9 MHz marker becomes maximum level.
2	S. TRAP Coil	TP2 (V. DET OUT)	T2 (S. TRAP)	Sweep generator (33.4 MHz)	1. In the same manner as above item 1, connect the sweep generator and power supplies. 2. Adjust T2 (S. trap coil) so that sound IF carrier 33.4 MHz marker becomes minimize level.

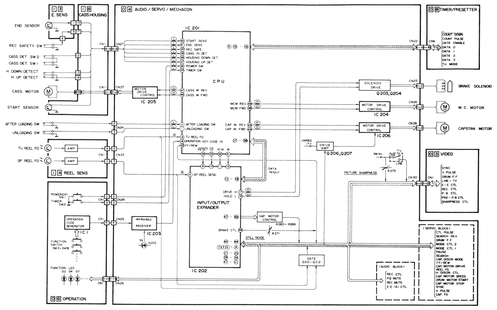
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
3	SAW Coil	TP2 (V. DET OUT)	T1 (SAW COIL)	Sweep generator (34.47 MHz) Sweep generator (38.9 MHz)	1. Connect the sweep generator out (B) (sweeper probe (B)) to test point inside the tuner unit. 2. Sweep level and power supplies are the same manner as above item 1. 3. Adjust T1 (SAW coil) so that 34.47 MHz marker becomes maximum level. 
4	IF Coil	TP2 (V. DET. OUT)	IF Coil (Inside the tuner unit.)	Sweep generator (37.5 MHz)	1. Connect the sweep generator out (B) (sweeper probe (B)) to test point inside the tuner unit. 2. Sweep level and power supplies are the same manner as item 1. 3. Adjust IF coil (inside the tuner unit) so that 37.5 MHz marker becomes maximum level.
5	AFC Coil	Pin 24 of IC1 (M51316P)	T4 (AFC COIL)	Sweep generator (38.9 MHz)	1. Set AFC SW to ON and sweep generator to 8.5 mVrms. 2. Connect the oscilloscope to pin 24 of IC1. 3. Adjust the sweep gain so that the "S" curve appears as observed with the oscilloscope. Adjust AGC bias so that the "S" curve does not distort. 4. Adjust T4 (AFC) so that video IF carrier (38.9 MHz) becomes 6.0 V DC as shown in figure. 

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
6	AGC	IF end (at the tuner unit)	R11 (AGC)	Color bar TV channel signal generator	1. Supply a color bar signal of VHF channel 7 from a TV channel signal generator and select the channel corresponding to the generator. 2. Adjust R11 so that IF end level of the tuner unit becomes maximum. 3. Readjust R11 so that the level becomes −10 dB with reference to the previous measured level.
7	Color Level	TP3 (VIDEO)	R39 (COLOR LEVEL)	Color bar TV channel signal generator	1. Supply a color bar signal of VHF channel 7 from a TV channel signal generator and select the channel corresponding to the generator. 2. With AFC SW ON, adjust R39 to satisfy the figure at TP3.  b: magenta a : b = 1: 0.45
8	AUDIO Level (E only)	TP4 (AUDIO)	R44 (AUDIO LEVEL)	Color bar TV channel signal generator	1. Supply a video signal and 1 kHz audio RF signal of VHF channel 7 from a TV channel signal generator and select the channel corresponding to the generator. 2. Adjust R44 for −14 dBs (0.44Vp-p) at TP4.

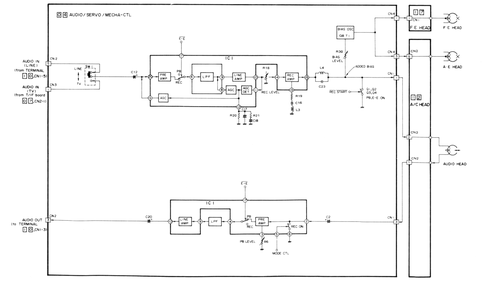
SECTION 4 CHART AND DIAGRAMS

4.1 BLOCK DIAGRAMS

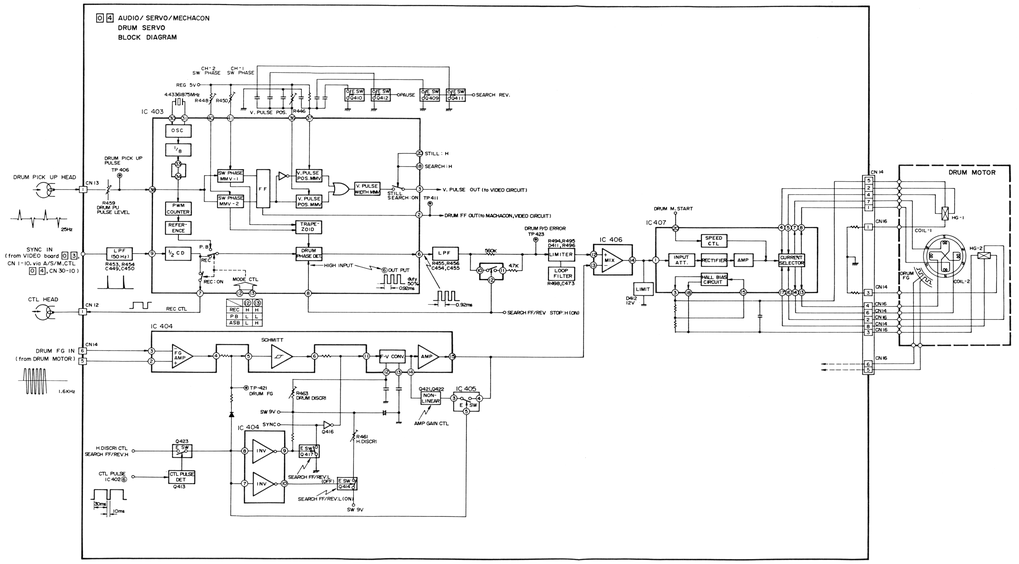
4.1.1 Mechacon block diagram



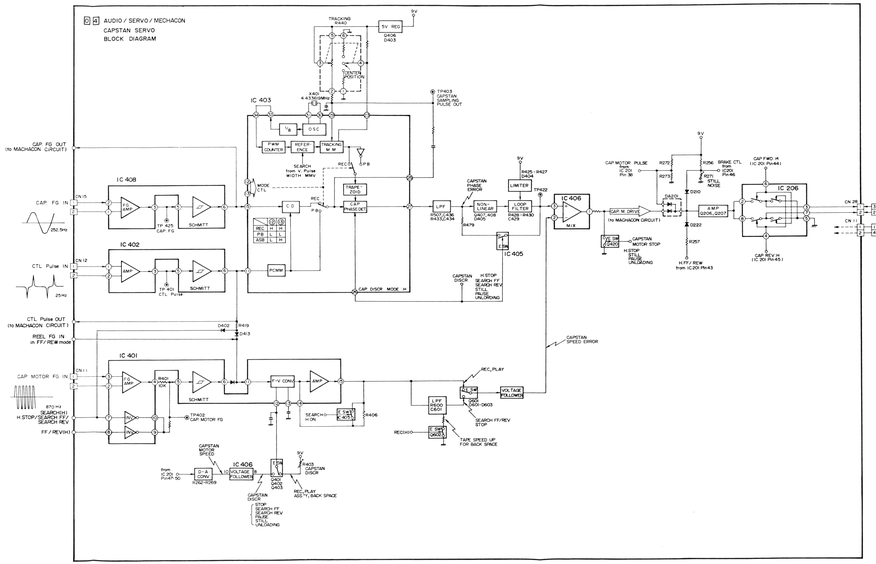
4.1.2 Audio block diagram



4.1.3 Drum servo block diagram

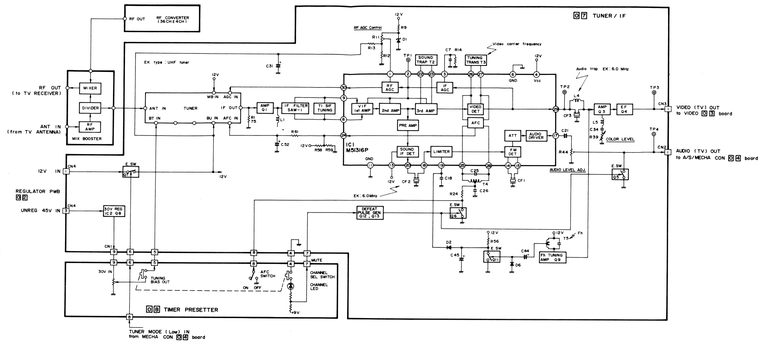


4.1.4 Capstan servo block diagram

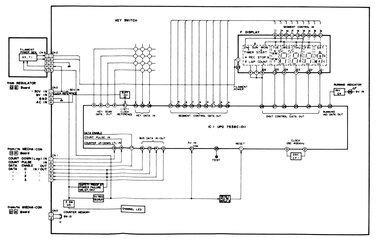


4-1 4-1

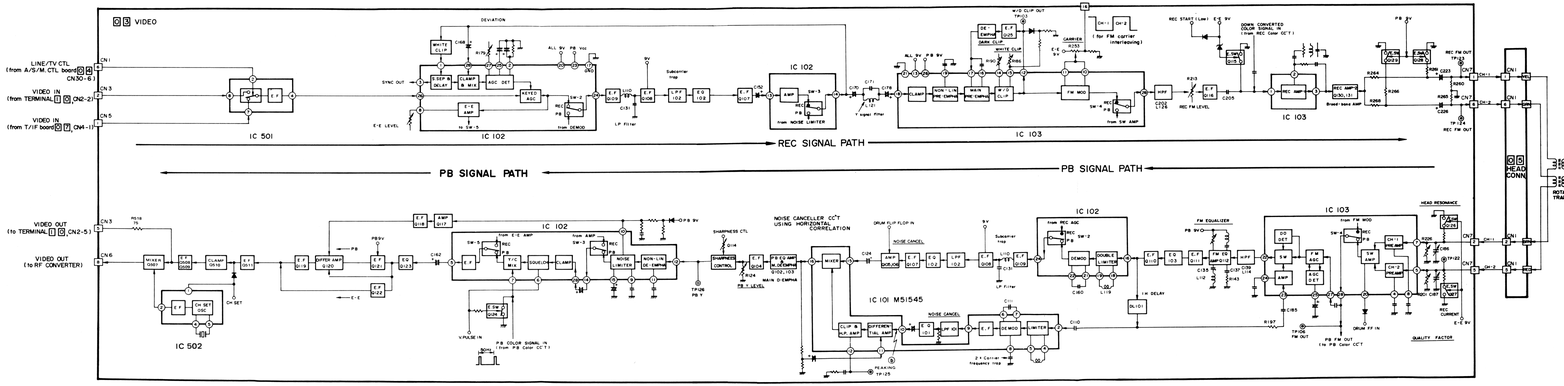
4.1.5 Tuner/IF block diagram



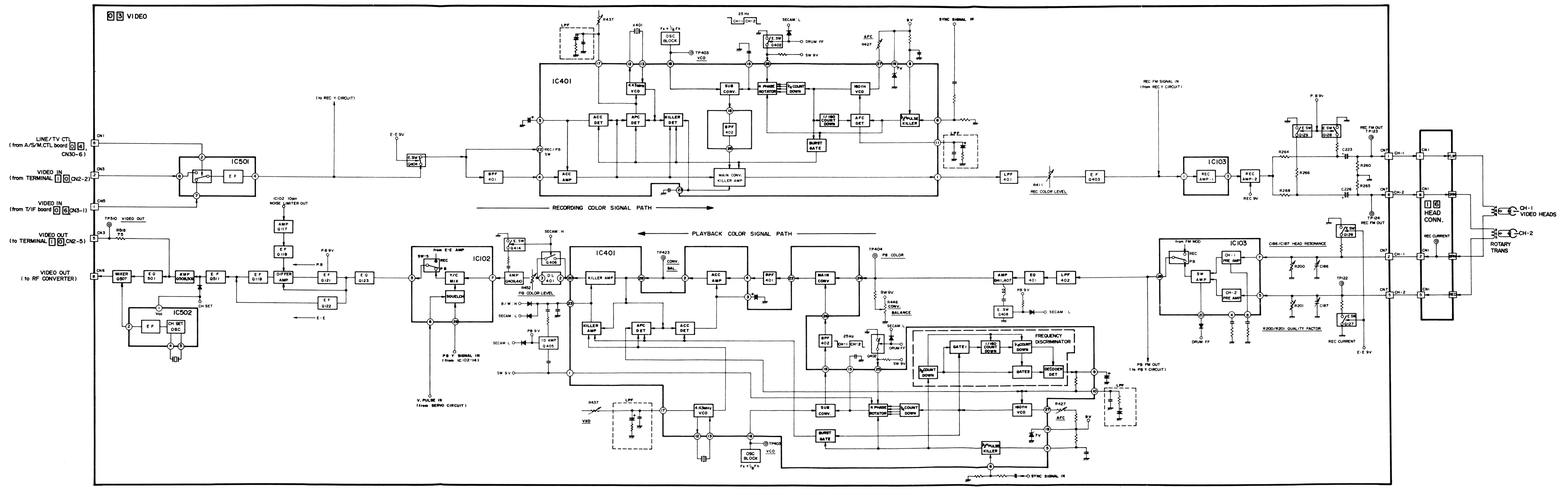
4.1.6 Timer/Pre-setter block diagram



4.1.7 Luminance block diagram



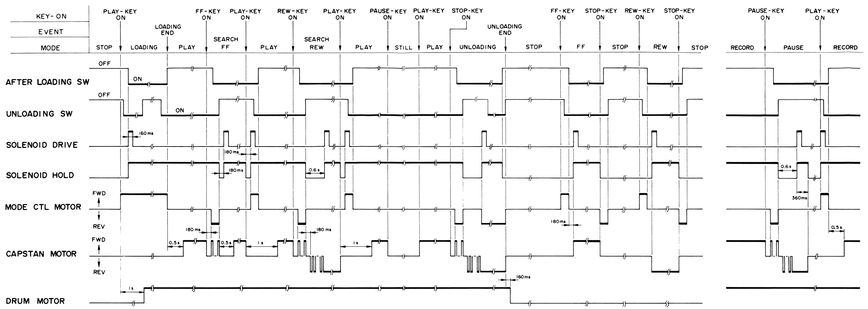
4.1.8 Color block diagram

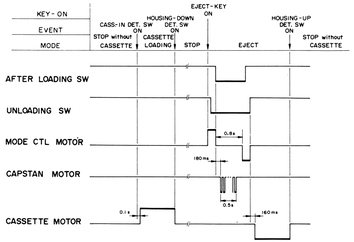


4-3 4-3

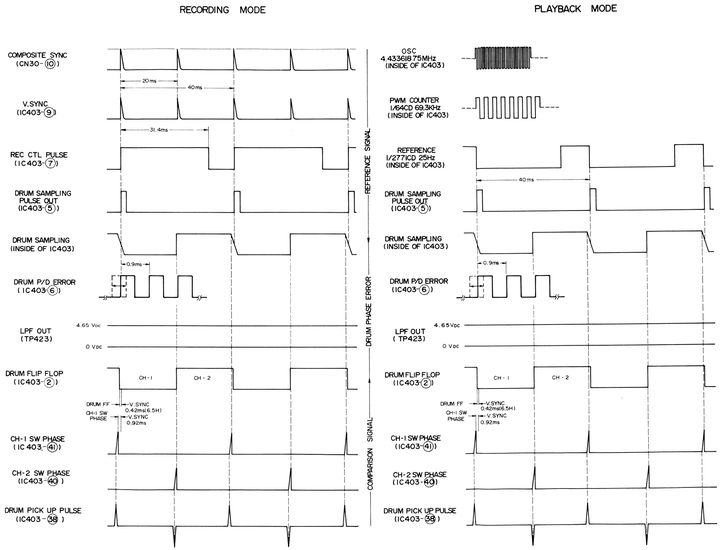
4.2 TIMING CHARTS

4.2.1 Mechacon timing chart

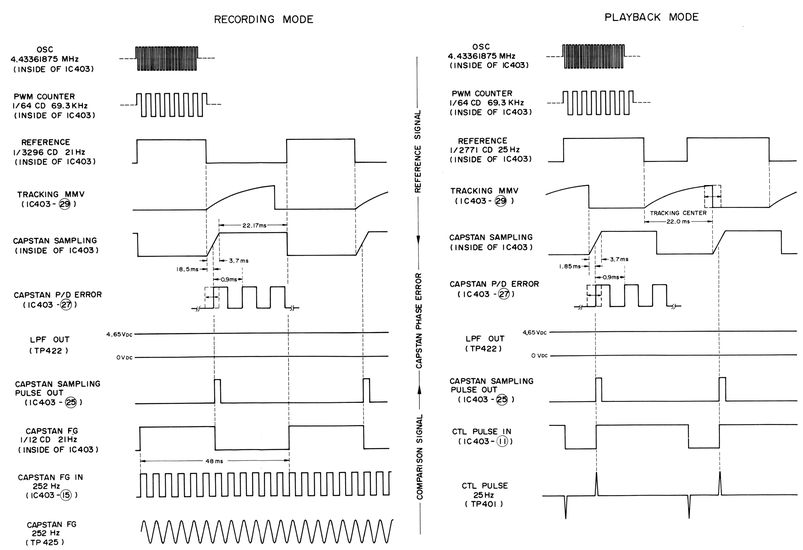




4.2.2 Drum servo timing chart



4.2.3 Capstan servo timing chart



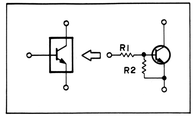
4.3 KEY TO ABBREVIATIONS

A	AC	:	Alternating Current
	ACC	:	Automatic Color Control
	A/CTL	:	Audio/Control
	A. DUB	:	Audio Dubbing
	AE	:	Audio Erase
	AFC	:	Automatic Frequency Control
	AGC	:	Automatic Gain Control
	AL	:	After Loading
	ALL	:	Always
	AMP	:	Amplifier
	ANT	:	Antenna
	APC	:	Automatic Phase Control
	AR	:	After Recording
	AUX	:	Auxiliary
B	B	:	Base
	BAL	:	Balance
	BLK	:	Black
	BLU	:	Blue
	BPF	:	Band-Pass Filter
	BRN	:	Brown
	B. SOL	:	Brake Solenoid
	B/W	:	Black and White
C	CAP	:	Capstan
	CARR	:	Carrier
	CASS	:	Cassette
	CD	:	Count Down
	CF	:	Ceramic Filter
	CH	:	Channel
	COL	:	Color (Colour)
	COMP	:	Comparator
	CONN	:	Connector
	CONV	:	Converter
	COUNT SEA	:	Counter Search
	C. PAUSE	:	Camera Pause
	C. SW	:	Cassette Switch
	CTL	:	Control
D	DAC	:	Digital to Analog Converter
	DEMOD	:	Demodulator
	DET	:	Detector
	DL	:	Delay Line
	DOC	:	Drop Out Compensator
	D. PU	:	Drum Pick-up
	DRUM FF	:	Drum Flip-Flop
E	EF	:	Emitter Follower
	EMPHA	:	Emphasis
	EQ	:	Equalizer
	E. SENS	:	End Sensor
	E. SW	:	Electronic Switch
F	F	:	Fuse
	F. ADV	:	Frame Advance
	FE	:	Full Erase
	FF	:	Fast Forward Flip-Flop
	FG	:	Frequency Generator
	FM	:	Frequency Modulation
	FR	:	Full Recording
	FWD	:	Forward
G	GEN	:	Generator
	GND	:	Ground
	GRN	:	Green
	GRY	:	Gray
H	HG	:	Hall Generator
	HPF	:	High-Pass Filter
I	ID	:	Identification
	IF	:	Intermediate Frequency
	IND	:	Indicator
	INV	:	Inverter
J	–		–
K	–		–
L	L	:	Low
	LED	:	Light Emitting Diode
	LOAD	:	Loading
	LPF	:	Low-Pass Filter
M	M.	:	Motor
	MDA	:	Motor Drive Amplifier
	MECHACON	:	Mechanism Control
	MIC	:	Microphone
	MIX	:	Mixer, Mixing
	MMV	:	Monostable Multivibrator
	MOD	:	Modulator
	MUTE	:	Muting
N	NC	:	Non Connection
	NON-LIN	:	Non-Linear
O	OP	:	Operation
	ORN	:	Orange
	OSC	:	Oscillator
P	PB	:	Playback
	PI	:	Photo Interrupter
	PR	:	Pinch Roller
	P/S	:	Pause/Still
	P. TR	:	Power Transistor
	PU	:	Pick-up
	PWB	:	Printed Wiring Board
Q	–		–
R	REC	:	Recording (Record)
	RED	:	Red
	REG	:	Regulator
	REV	:	Reverse
	REW	:	Rewind
	RF	:	Radio Frequency
	R/P	:	Record/Playback
	RT	:	Rotary Transformer
	RUN IND	:	Running Indicator
	RY	:	Relay
S	SAFE	:	Safety
	SEAR	:	Search
	SEC	:	Second
	SEL	:	Select
	SENS	:	Sensor
	SF	:	Source Follower
	SOL	:	Solenoid
	S. R	:	Supply Reel
	S. SENS	:	Start Sensor
	S. SEP	:	Sync Separator
	SW	:	Switch
T	T. E ALM	:	Tape End Alarm
	TP	:	Test Point
	TR	:	Transistor
	TRANS	:	Transformer
	T. REC	:	Timer Record
	T. SW	:	Timer Switch
	T/T	:	Tuner/Timer
	TU	:	Take-up
	TU. R	:	Take-up Reel
U	UL	:	Unloading
V	V	:	Volt
	VCO	:	Voltage Controlled Oscillator
	VLT	:	Violet
	V. PULSE	:	Vertical Pulse
	V. SEL	:	Video Select
	V/T	:	Video/Television
	V/U	:	VHF/UHF
	VXO	:	Variable Crystal Oscillator
W	W	:	Watt
	W/D	:	White and Dark
	WHT	:	White
Y	Y	:	Luminance
	YLW	:	Yellow
Z	–		–

4-5

4.4 DIGITAL TRANSISTOR

DIGITAL TRANSISTOR



RESISTOR VALUES

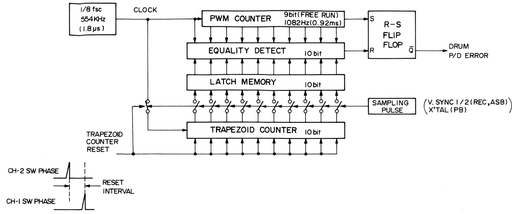
JUNCTION	Part NO.	R1 (KΩ)	R2 (KΩ)
PNP	DTA114	10	10
	DTA124	22	22
	DTA144	47	47
	DTA144WF	47	22
	DTA114Y	10	47
	DTA114T	10	OPEN
NPN	DTC114	10	10
	DTC124	22	22
	DTC144	47	47
	DTC144WT	47	22
	DTC114Y	10	47
	DTC143T	4.7	OPEN

Note: The digital transistor is a type that includes built in resistors.
It features and small size and high reliability.
Both PNP and NPN types are available.

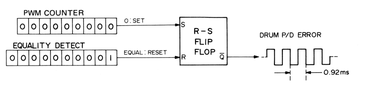
USES: INVERTOR, INTERFACE, DRIVER CIRCUITS.

4.5 DRUM PHASE DETECT PRINCIPLE

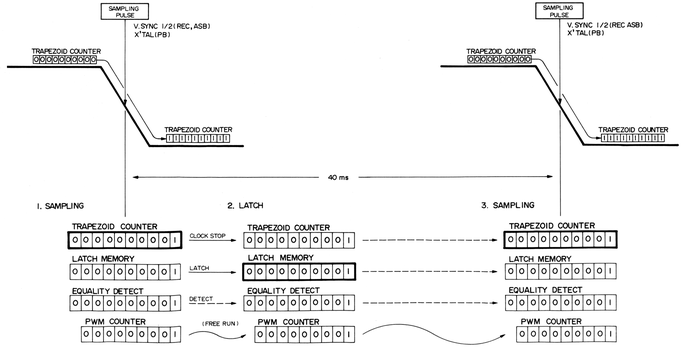
DRUM PHASE DETECTOR BLOCK DIAGRAM



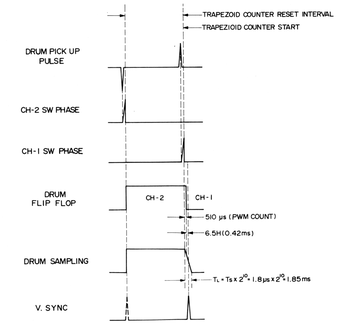
WAVEFORM



DRUM PHASE DETECT SYSTEM (NORMAL STATE)



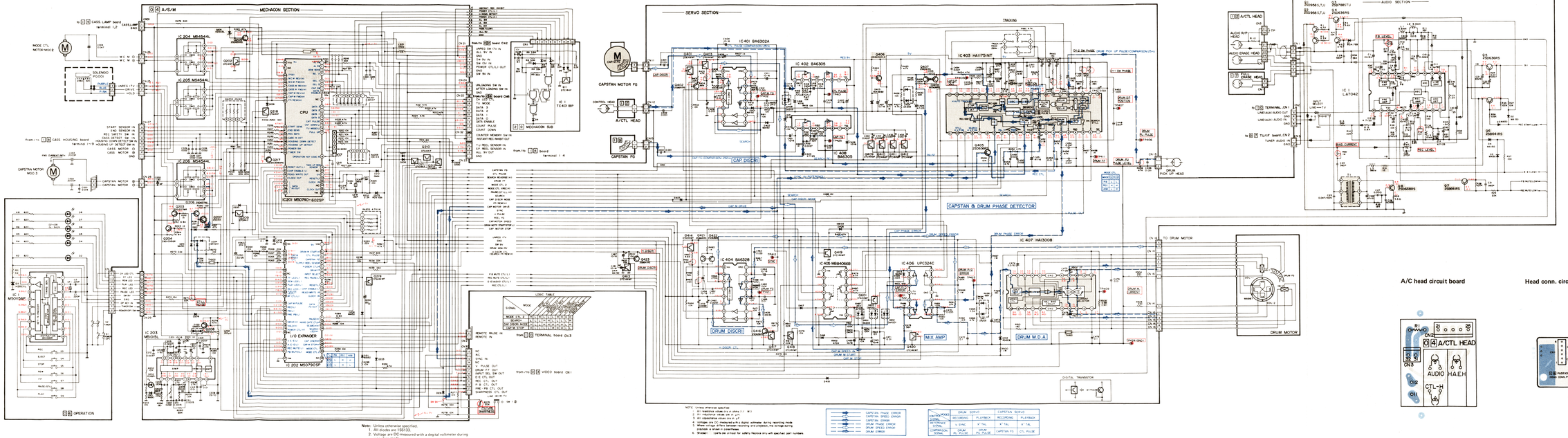
TIMING CHART



4-5

4.4 SCHEMATIC AND CIRCUIT BOARD DIAGRAMS

4.4.1 Audio/Servo/Mechacon, Operation, Mechacon sub circuit (A/C head, Head conn. board)


MECHACON SECTION
SERVO SECTION
AUDIO SECTION
OPERATION
CAPSTAN & DRUM PHASE DETECTOR
DRUM M.D.A
MIX AMP
DRUM DISCRI
CAP DISCRI
TRACKING
DRUM MOTOR
A/C HEAD
CAPSTAN MOTOR FG
CAPSTAN FG
DRUM PICK UP HEAD
IC 204 M54544L
IC 205 M54544L
IC 206 M54544L
IC201 M50760-602SP
IC 202 M50795SP
IC 203 M50404L
IC 401 BA6302A
IC 402 BA6305
IC 403 HA11735NT
IC 404 BA6328
IC 405 M51405SP
IC 406 UPC324C
IC 407 HA13008
IC 1 LA7042
IC 1 TC4013BP
CPU
I/O EXPANDER
LOGIC TABLE
Note: Unless otherwise specified.
1. All diodes are 1SS133.
2. Voltage are DC-measured with a digital voltmeter during recording mode.
3. Where voltage differs between recording and stop, the voltage during stop/pause is shown in parentheses.
4. Voltages are DC-measured with a digital voltmeter during recording mode.
5. Where voltage differs between recording and playback, the voltage during playback is shown in parentheses.
6. Symbol: ∆ parts are critical for safety. Replace only with specified part numbers.
A/C head circuit board
Head conn. circuit board

4.4.2 Main waveforms of servo and audio circuit

Servo circuit

TP402 Cap. M. FG 1.1Vp-p 880Hz	IC401 ⑪ Cap. M. F-V Conv. In 8Vp-p 880Hz	IC401 ⑮ Cap. M. F-V Conv. out 4VDC	TP401 PB CTL pulse 8.5Vp-p 25Hz	TP425 Capstan FG 0.9Vp-p 250Hz
TP411 Drum F.F 7Vp-p 25Hz	IC403 ③ V. pulse out 7Vp-p	IC403 ⑤ Drum sampling pulse out 9Vp-p	IC403 ⑥ Drum F/D error 7.5Vp-p	IC403 ⑦ Rec CTL 8Vp-p 25Hz
IC403 ⑨ Sync in 0.5Vp-p	IC403 ⑩ CTL pulse in 6Vp-p 25Hz	IC403 ⑫ Drum FG in 7Vp-p 250Hz	IC403 ⑬ Cap. sampling pulse out 8Vp-p	TP403 Cap. sampling Pulse position
IC403 ㉗ Cap. P/D error 7Vp-p	IC403 ㉘ Tracking MMV 2.5Vp-p	IC403 ㉙ Osc in 0.45Vp-p 4.43MHz	IC403 ㉞ 1/8 f_{SC} in 2.8Vp-p 0.55MHz	IC403 ㉟ V. pulse width MM 2.5Vp-p
IC403 ㊱ V. pulse MMV (Neg.) 4.5Vp-p	IC403 ㊲ V. pulse MMV (Pos.) 4.5Vp-p	IC403 ㊵ CH-2 sw PHASE MMV 2.5Vp-p	IC403 ㊶ CH-1 sw PHASE MMV 2.5Vp-p	TP407 Drum sampling position
TP406 Drum pick up pulse 2Vp-p 25Hz	TP421 Drum FG 1.8Vp-p 1.6kHz	IC404 ⑬ Drum F-V Conv. In 6.2Vp-p 1.6kHz	IC404 ⑮ Drum F-V conv. out 4.5VDC	TP412 Sync 1.7Vp-p
TP422 Cap. Error 4.6Vp-p	IC406 ① Cap. M. Drive 0.7VDC	TP423 Drum Error 4.6VDC	IC407 ① Drum MDA in 5.6VDC	IC407 ⑦ ⑧ ⑬ ⑭ Drum MDA out 6.2 Vp-p
Q207 E Cap. M. Drive Amp Out 5VDC				

Audio circuit

CN2 ⑤ Audio in 1kHz -20dB (220mVp-p)
IC1 ⑲ Line Amp out 1kHz 0dB (2.2Vp-p)
T1 ③ ⑥ Bias Osc 68kHz 200Vp-p
CN1 ① REC Audio 9Vp-p
CN2 ③ Audio out 1kHz 0dB (2.2Vp-p)

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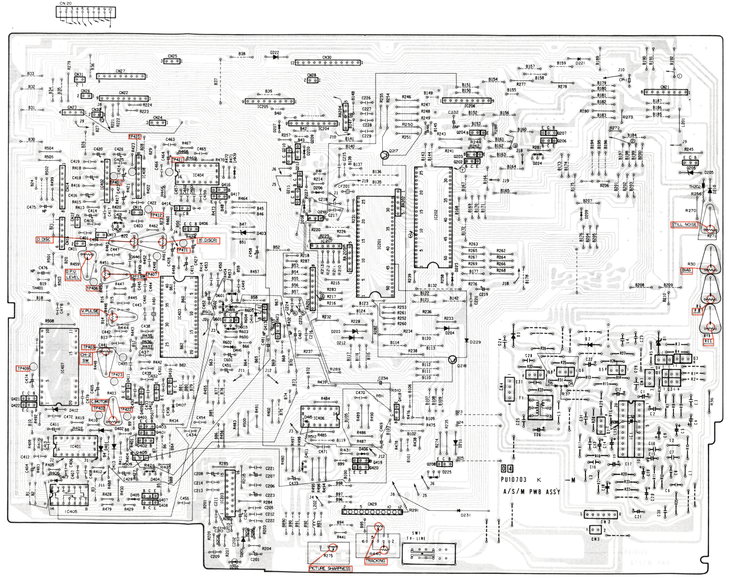
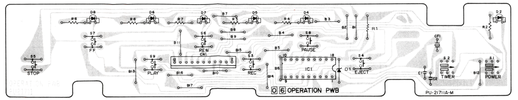
4.4.3 Audio/Servo/Mechacon circuit board



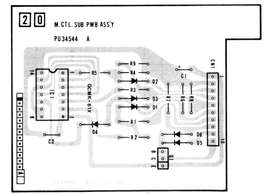
4-7

4-7

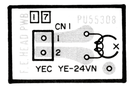
4.4.4 Operation circuit board



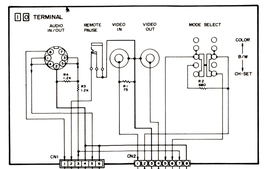
4.4.5 Mechacon sub circuit board



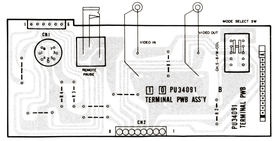
4.4.6 Full erase circuit board



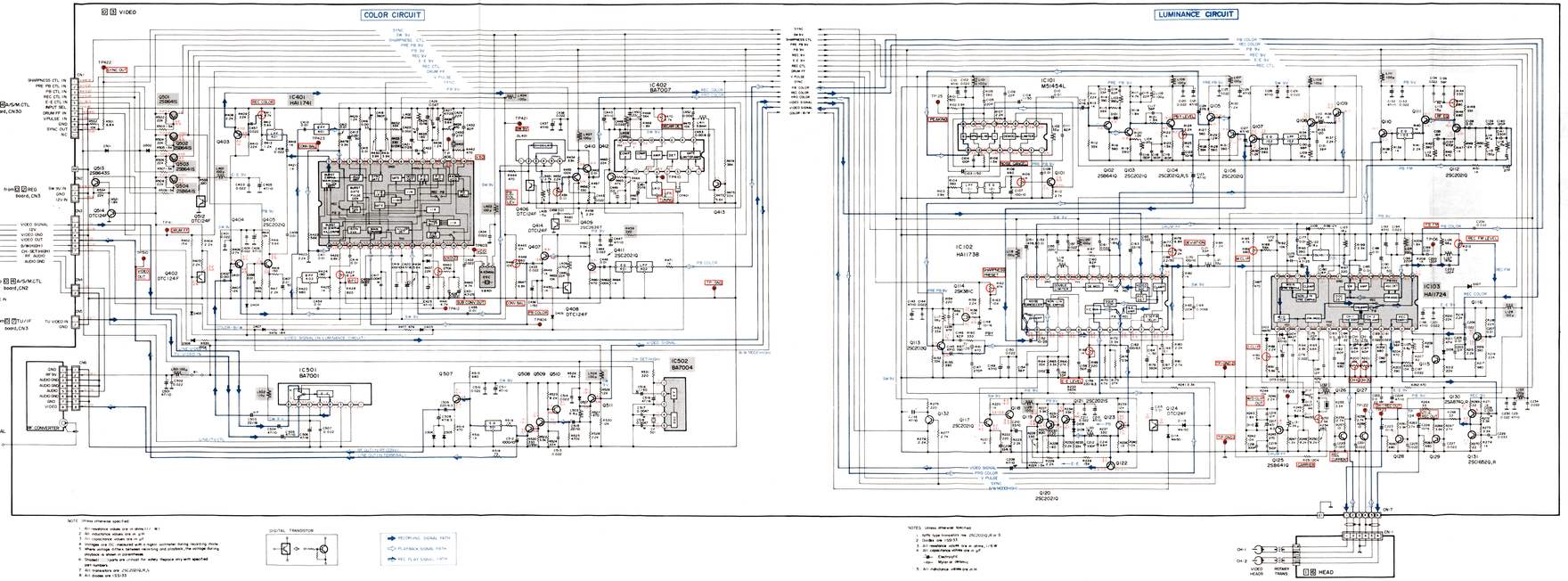
4.4.7 Terminal circuit



4.4.8 Terminal circuit board

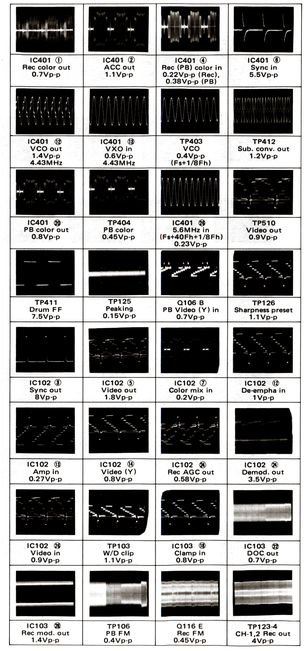


4.4.9 Video circuit

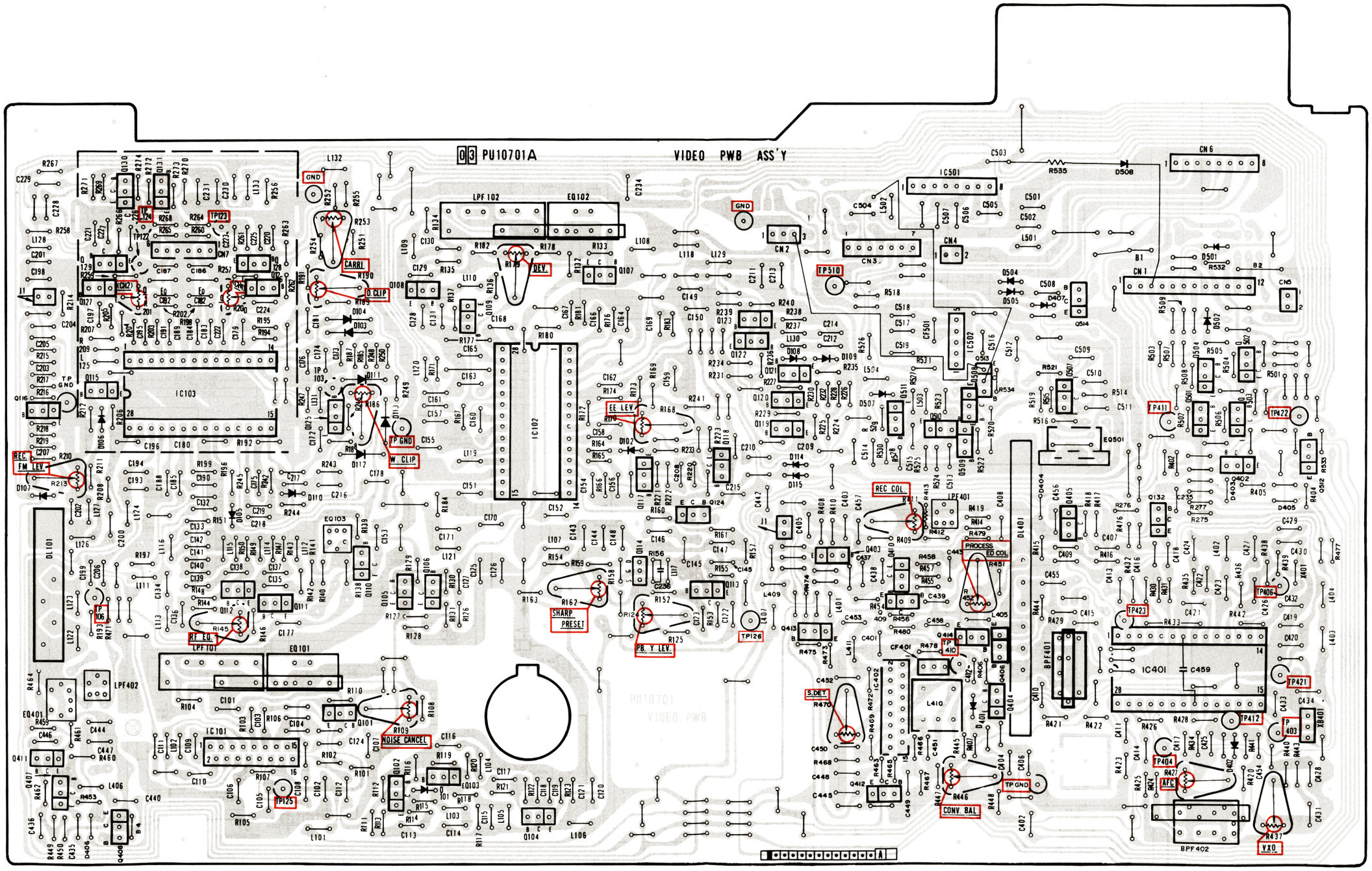


4.4.10 Main wave forms of video circuit

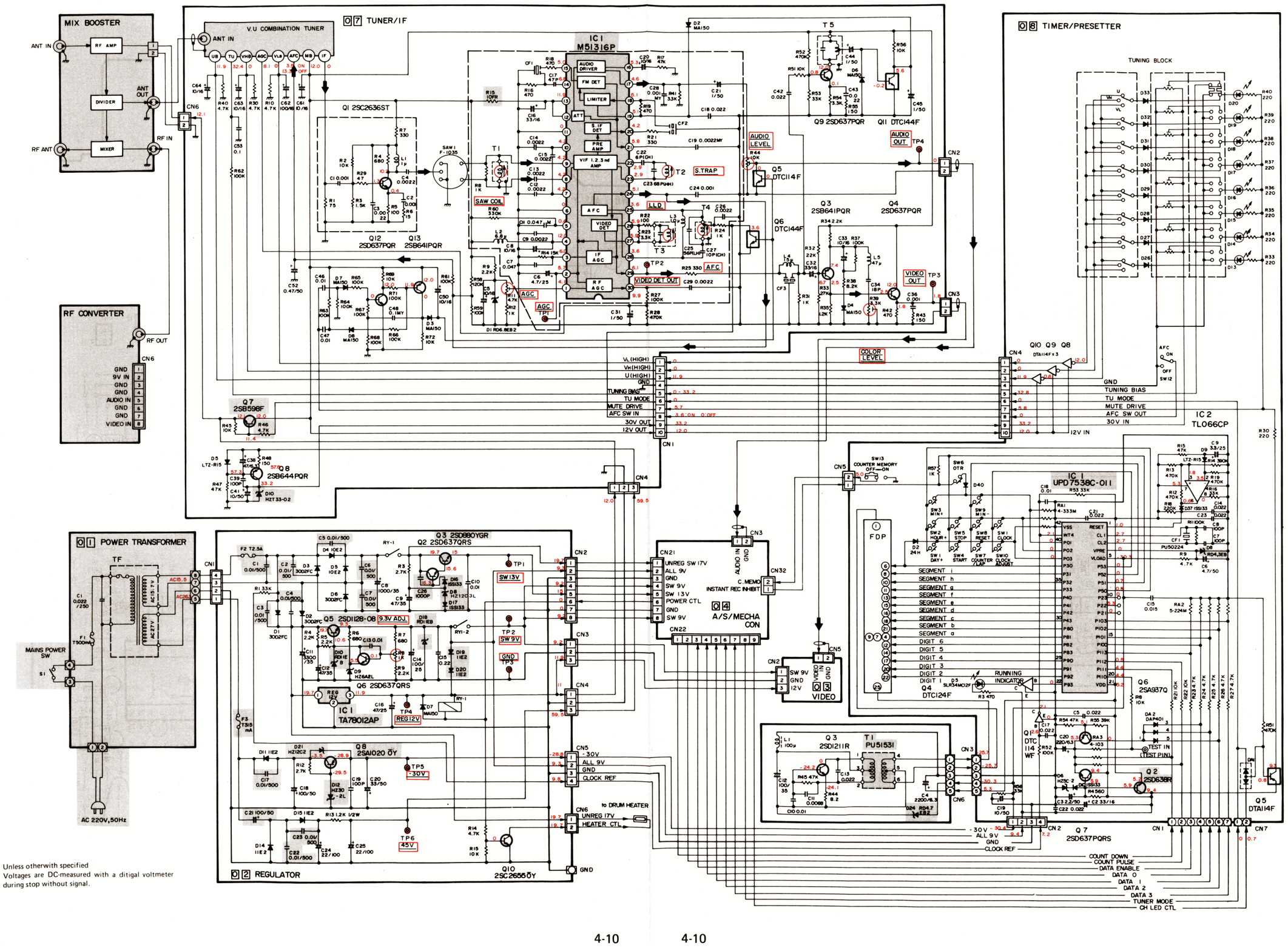
Video circuit


IC401 ① Rec color out 0.7Vp-p
IC401 ② ACC out 1.1Vp-p
IC401 ④ Rec (PB) color in 0.22Vp-p (Rec), 0.38Vp-p (PB)
IC401 ⑤ Sync in 5.5Vp-p
IC401 ⑥ VCO out 1.4Vp-p 4.43MHz
IC401 ⑨ VXO in 0.6Vp-p 4.43MHz
TP403 VCO 0.4Vp-p (Fs+1/8Fh)
TP412 Sub. conv. out 1.2Vp-p
IC401 ⑩ PB color out 0.8Vp-p
TP404 PB color 0.45Vp-p
IC401 ⑪ 5.6MHz in (Fs+40Fh+1/8Fh) 0.23Vp-p
TP510 Video out 0.9Vp-p
TP411 Drum FF 7.5Vp-p
TP125 Peaking 0.15Vp-p
Q106 B PB Video (Y) in 0.7Vp-p
TP126 Sharpness preset 1.1Vp-p
IC102 ③ Sync out 8Vp-p
IC102 ⑤ Video out 1.8Vp-p
IC102 ⑦ Color mix in 0.2Vp-p
IC102 ⑧ De-empha in 1Vp-p
IC102 ⑨ Amp in 0.27Vp-p
IC102 ⑩ Video (Y) 0.8Vp-p
IC102 ⑫ Rec AGC out 0.58Vp-p
IC102 ⑬ Demod. out 3.5Vp-p
IC102 ⑭ Video in 0.9Vp-p
TP103 W/D clip 1.1Vp-p
IC103 ⑭ Clamp in 0.8Vp-p
IC103 ⑮ DOC out 0.7Vp-p
IC103 ⑯ Rec mod. out 1.4Vp-p
TP105 PB FM 0.4Vp-p
Q116 E Rec FM 0.45Vp-p
TP123-4 CH-1,2 Rec out 4Vp-p

4.4.11 Video circuit board



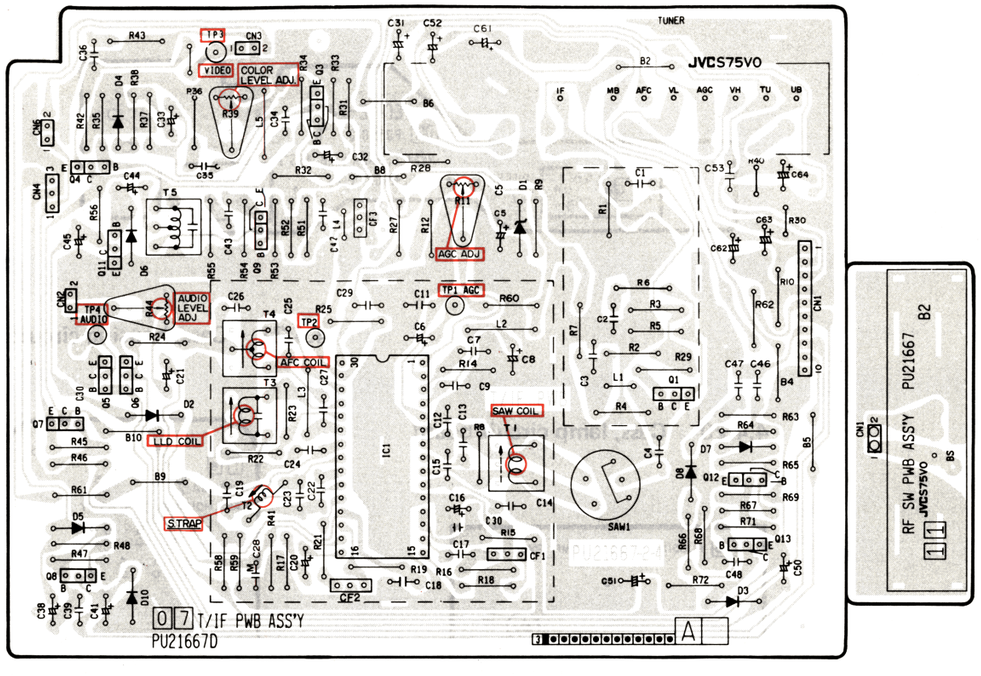
4.4.12 Tuner/IF, Timer/pre-setter, power trans, regulator circuit



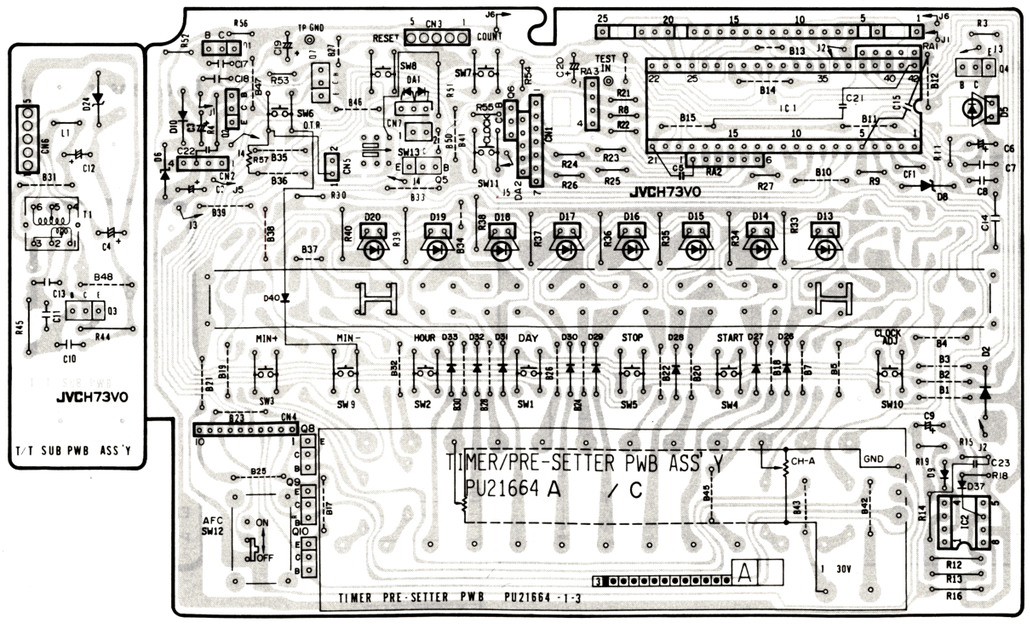
Note: Unless otherwith specified
1. Voltages are DC-measured with a ditigal voltmeter during stop without signal.

4-10

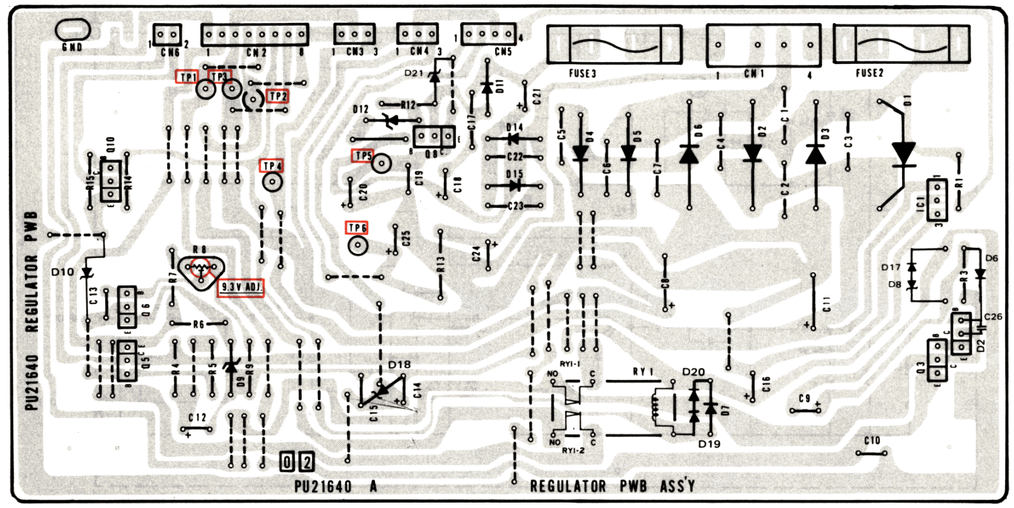
4.4.13 Tuner/IF circuit board



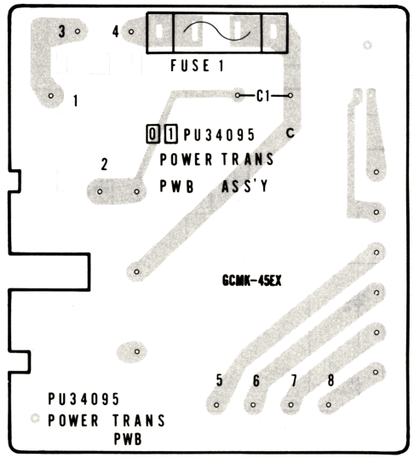
4.4.14 Timer/Pre-setter circuit board



4.4.15 Regulator circuit board

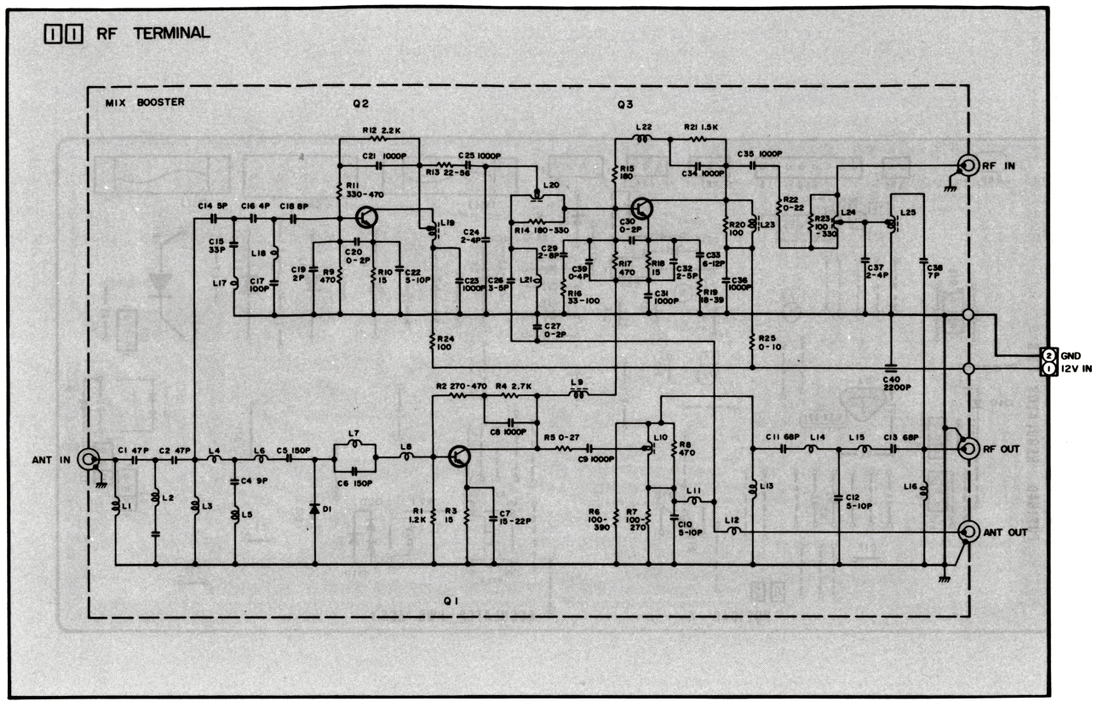


4.4.16 Power trans circuit board



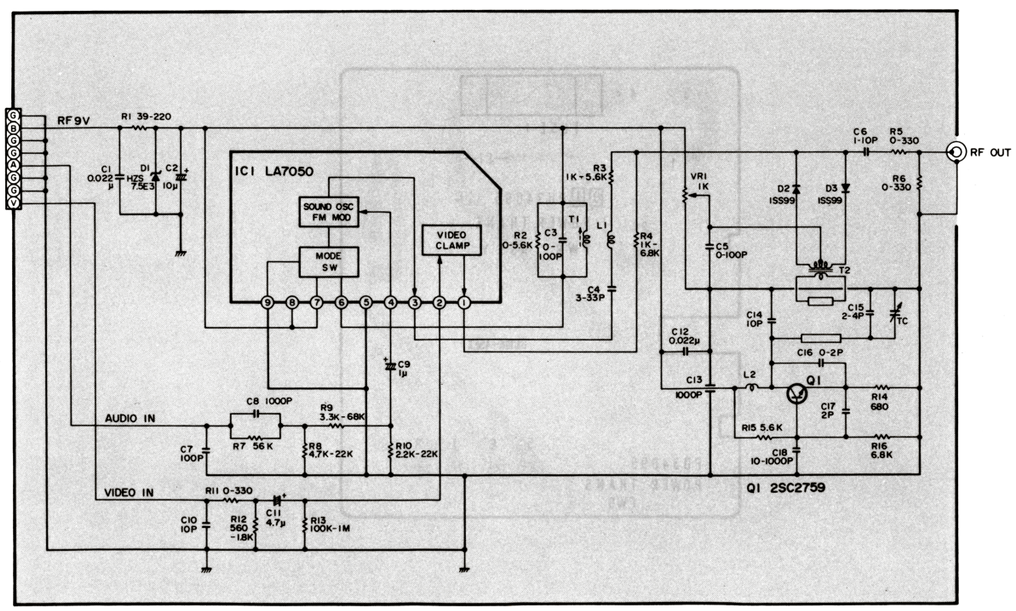
4-11

4.4.17 Mix booster circuit

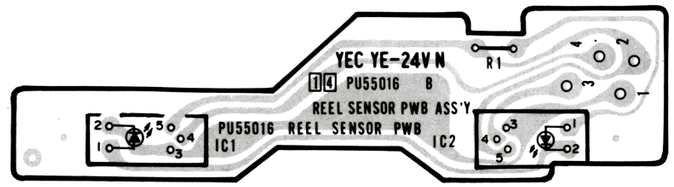


NOTE : 1 Q1, Q2, Q3 : 2SC2570A or 2SC3355 or Equivalent.
2 D1 : IS2076 or IS2473 or Equivalent.
3 All resistance values : Ohm
4 All capacitance vales : F

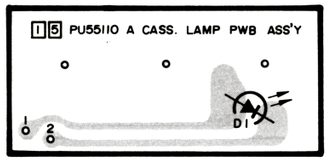
4.4.18 RF converter circuit



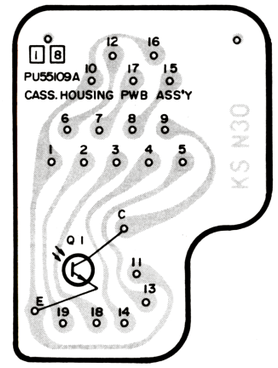
4.4.19 Reel sensor circuit board



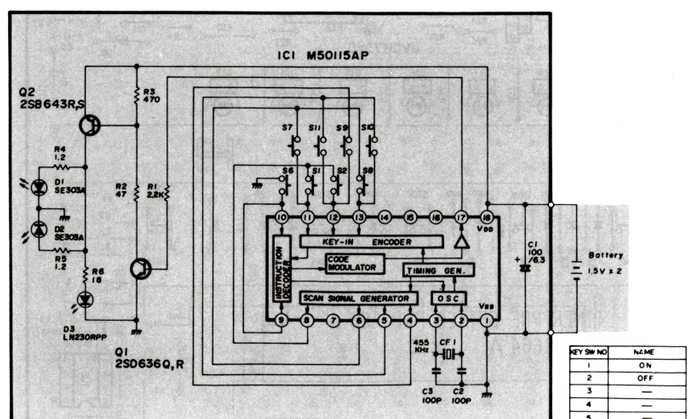
4.4.20 Cass, lamp circuit board



4.4.21 Cass, housing circuit board

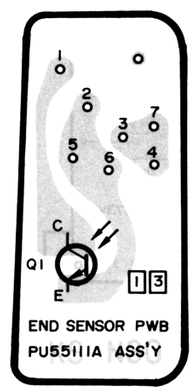


4.4.22 Remote control circuit



KEY SW NO	NAME
1	ON
2	OFF
3	—
4	—
5	—
6	REC
7	STOP
8	PAUSE/STILL
9	FF/SHUTTLE
10	PLAY
11	REW/SHUTTLE

4.4.23 End sensor circuit board



4-12

4.4.24 Overall wiring diagram

4-13

4.4.25 Mode shift table

CURRENT MODE / KEY OPERATION	EJECT (NO CASS.)	STOP	FF	REW	PLAY	STILL	SEARCH FF	SEARCH REW	REC	REC PAUSE	LOADING (PLAY)	LOADING (REC)	UN-LOADING	BACK SPACE ASSEMBLY	INSTANT REC TIMER REC
EJECT		○	○	○	○	○	○	○	×	×	○	×	△	×	×
STOP	×		○	○	○	○	○	○	○	○	○	○	△	○	×
FF	×	○		○	SEARCH FF	SEARCH FF		SEARCH FF	×	×	×	×	△	×	×
REW	×	○	○		SEARCH REW	SEARCH REW	SEARCH REW		×	×	×	×	△	×	×
PLAY	×	○	○	○		○	○	○		○	△	△	○	△	×
PAUSE	×	×	×	×	STILL	FRAME ADJ	STILL	STILL	○		△	△	×	△	×
REC + PLAY	×	○	○	○	○	○	○	○		○	○	△	○	△	×
REC + PAUSE	×	○	○	○	○	○	○	○	○		○	△	○	△	×

○ : Enabled (Mode changes) △ : Enabled if meaningful to mode in progress × : Inhibited (Mode does not change)

4-14

SECTION 5
EXPLODED VIEWS AND PARTS LIST

SAFETY PRECAUTION

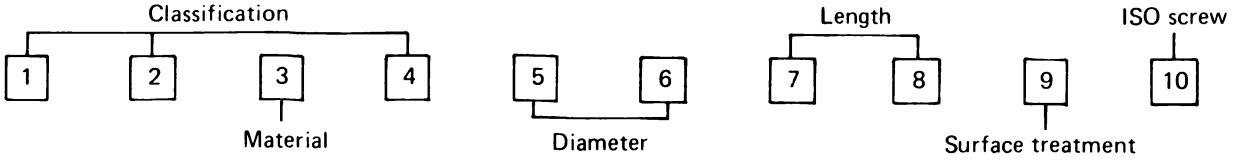
Parts identified by ⚠ symbol are critical for safety.
Replace only with specified part numbers.

5.1 STANDARD PART NUMBER CODING
5.1.1. Screw coding . . . . . 5 - 2

5.2 EXPLODED VIEWS AND PARTS LIST
5.2.1 Packing assembly. . . . . 5 - 3
5.2.2 Cabinet assembly. . . . . 5 - 4
5.2.3 Chassis assembly . . . . . 5 - 6
5.2.4 Mechanism assembly . . . . . 5 - 8
5.2.5 Drum assembly 5-11
5.2.6 Sub deck assembly. 5-12
5.2.7 Cassette housing assembly. 5-14
5.2.8 Remote control unit 5-16

5.1 STANDARD PART NUMBER CODING

5.1.1 Screw coding



Classification (first digit)

Symbol Letter	Name
S	Normal screw
N	Assembly screw
L	"
D	"
M	Wood screw
F	Feather screw
T	Set screw
Y	"
B	Bolt
N	Nut
W	Washer
R	E-ring
E	Eyelet
P	Spring
G	Washer head screw

Material (third digit)

Symbol Letter	Material
S	Steel
E	Stainless steel
C	Cast iron
U	Bronze
B	Brass
P	Phosphor bronze
N	German silver
Y	Brass
A	Aluminum
Z	Zinc alloy
K	Polycarbonate

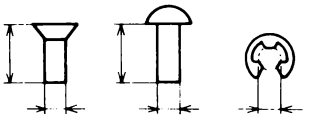
Shape of Screw Head (second digit)

Symbol Letter		Shape of Screw Head
P		Pan head
S		Flat countersunk head
H		Oval countersunk head
D		Binding head
R		Round head
B		Round head
T		Truss head

Type of Screw (fourth digit)

Symbol Letter	Type of Screw
P	Cross-Recessed head screw
A	Tapping screw
B	Special tapping screw
T	Special tapping screw
E	Special tapping screw
F	Special tapping screw

Diameter and Length of Screw (fifth – eighth digit)



– Example –

S P B P 3 0 0 6 Z S

(Diameter x 10) (Length)

Diameter : 3 mm

Length : 6 mm

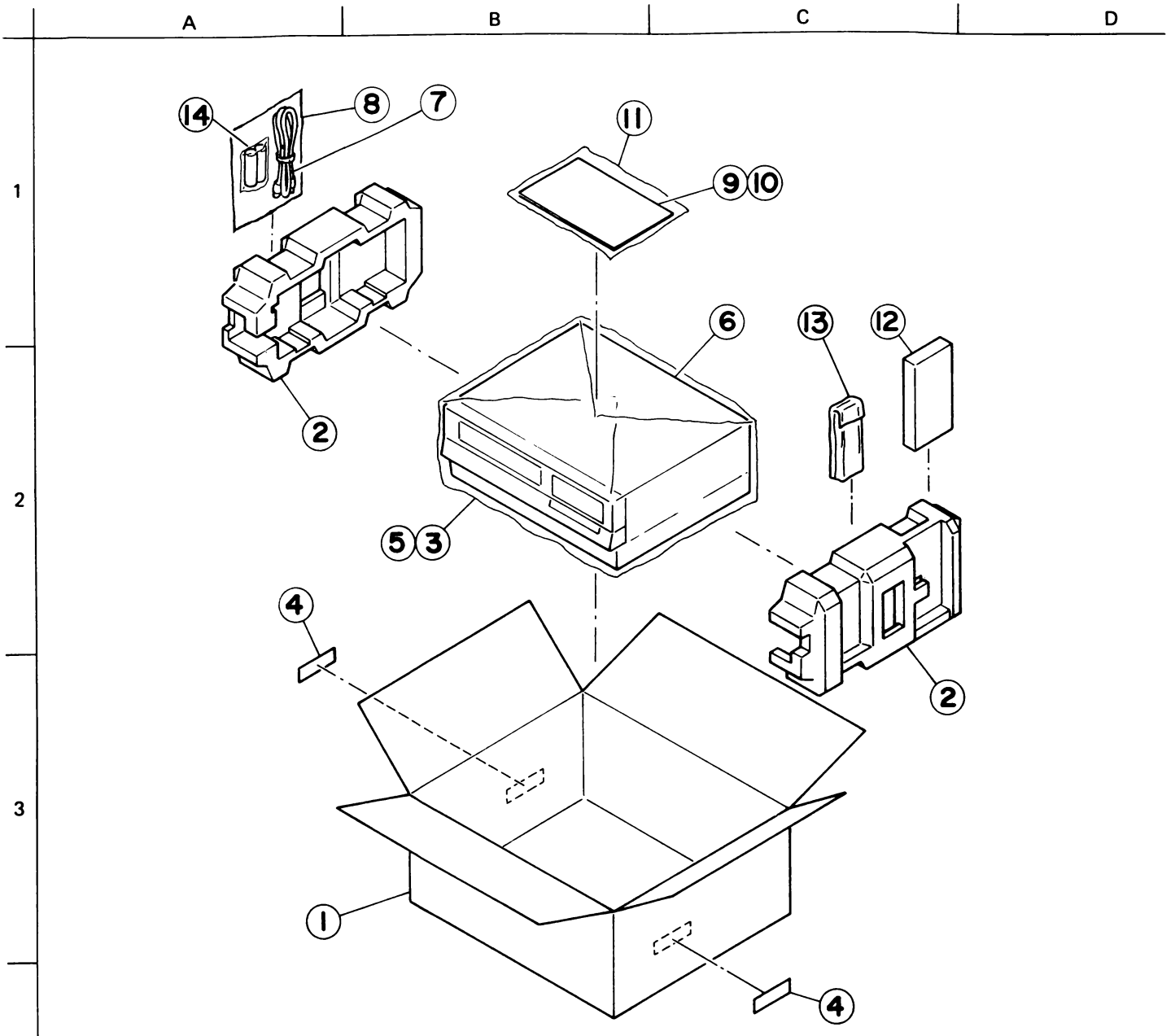
Surface Treatment (ninth digit)

Symbol Letter	Surface Treatment
Z	Galvanization, dichromic acid treatment (MFZn2-C)
N	Nickel plating (MFNi2, MFNi1)
R	Chrome plating (MBCr2, MBCr1)
G	Silver plating (SP4)
W	Nichrome platings
P	Phosphite treatment
B	Bronze plating

Symbol Letter	Surface treatment
M	Black coloring after galvanization
A	Red coloring after galvanization
C	Blue coloring after galvanization
T	Green coloring after galvanization
V	Violet coloring after galvanization
F	Iron with black coloring

5.2 EXPLODED VIEWS AND PARTS LIST

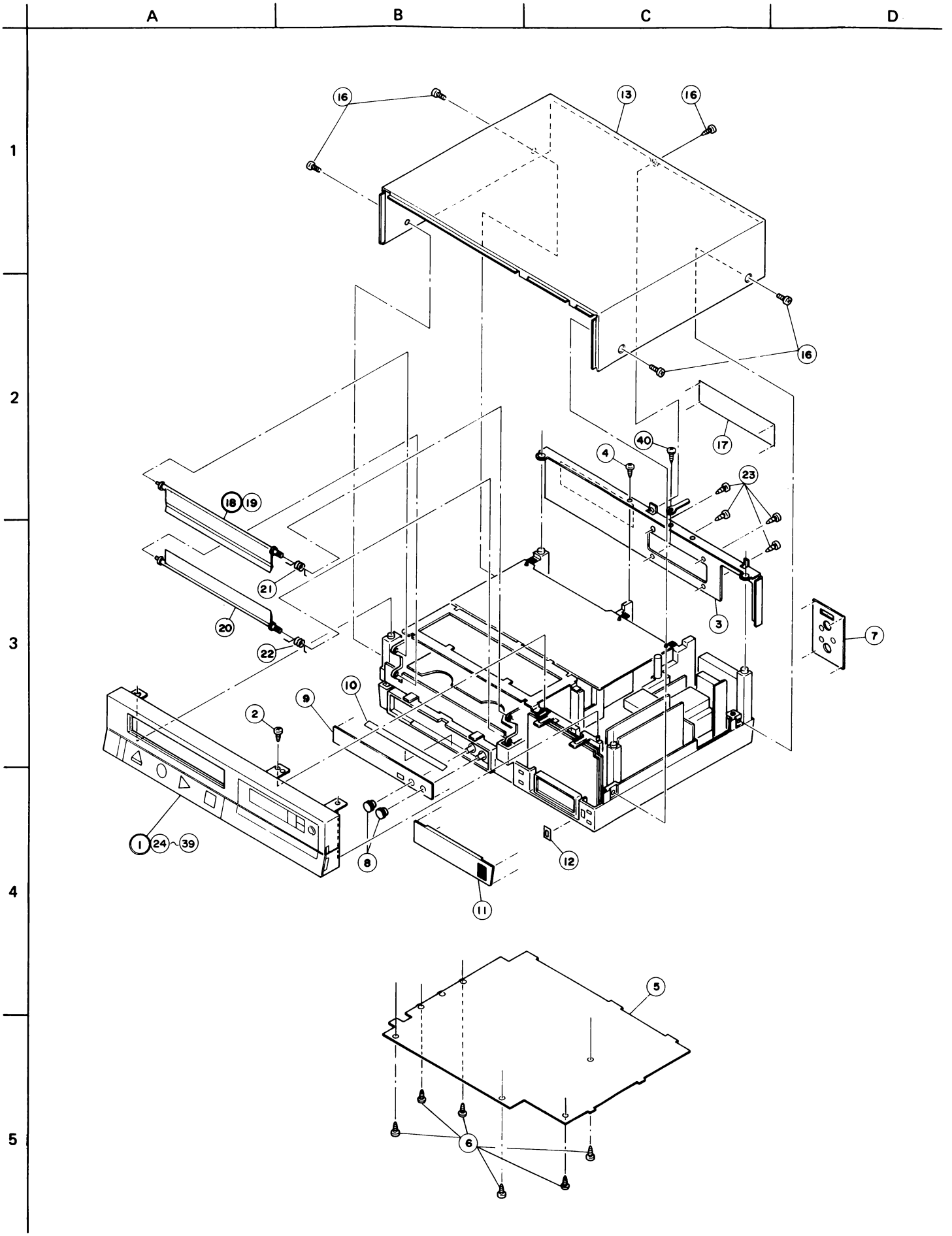
5.2.1 Packing assembly



— Packing assembly list —

Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
1	PQ30118-16	Packing Case	E	1	3-B,C
	" -17	"	EG	1	3-B,C
2	PU34338A	Cushion Assembly		1	1-A,B 2-C
3	PUM30021-33	Poly Bag		1	2-B,C
4	PUP40329	Serial No. Sticker		2	3-A 4-C
5	PUP40503-7	Sheet		1	2-B,C
6	—	Cabinet Assembly	See Section 5.2.2	1	2-B,C
⚠ 7	PU43294J	Aerial Cable Assembly		1	1-A
8	QPGA020-02005	Poly Bag		1	1-A
⚠ 9	PU30425-584	Instructions	E	1	1-B
⚠	" -585	"	EG	1	1-B
10	BT-20069	Warranty Card	EG only	1	1-C
11	QPQA025-03505	Poly Bag		1	1-B
12	PTE-30	Video Cassette		1	2-C
⚠ 13	—	Remote Control Unit	See Section 5.2.8	1	2-C
14	UM-3DJ2P	Battery		1	1-A

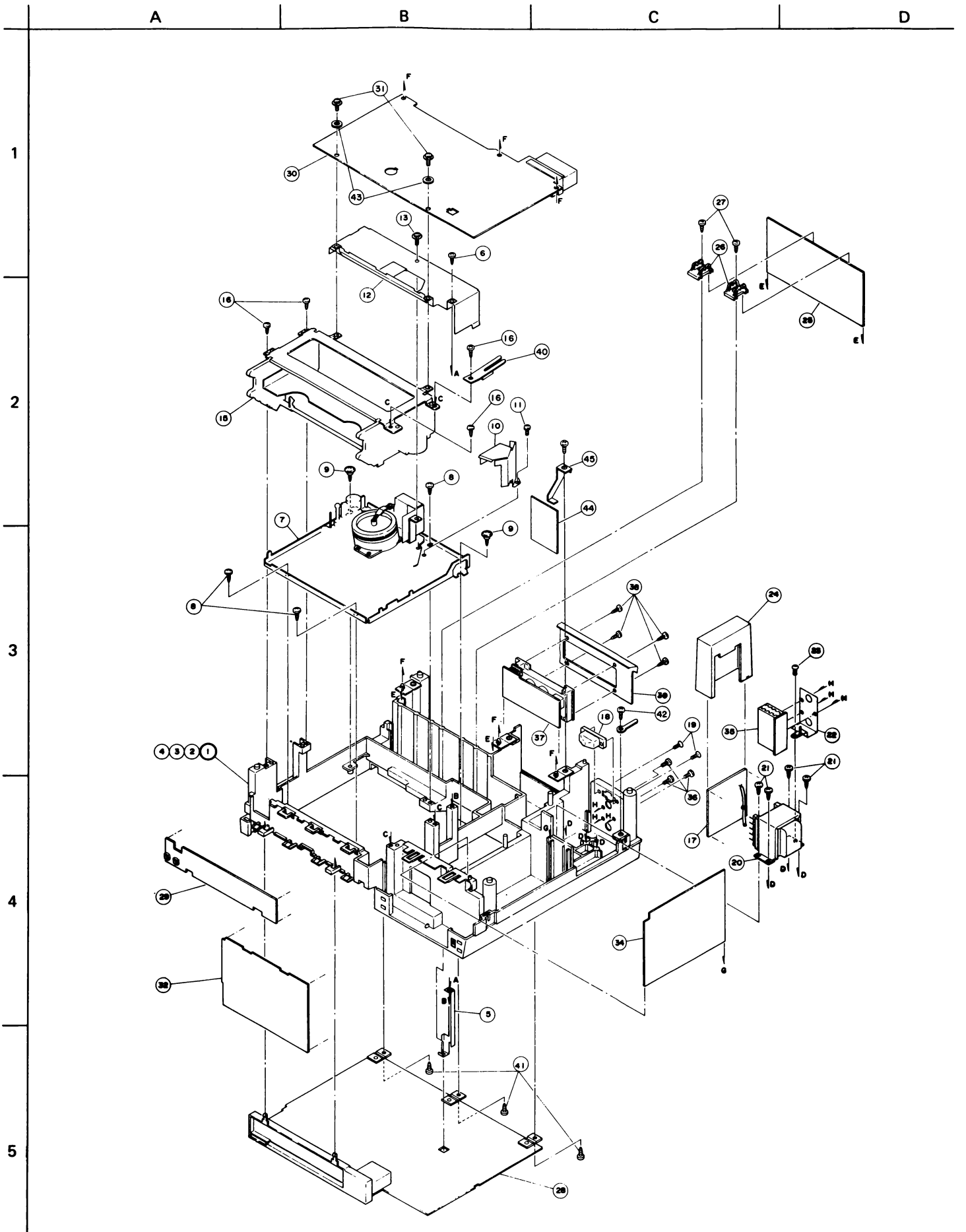
5.2.2 Cabinet assembly



– Cabinet assembly list –

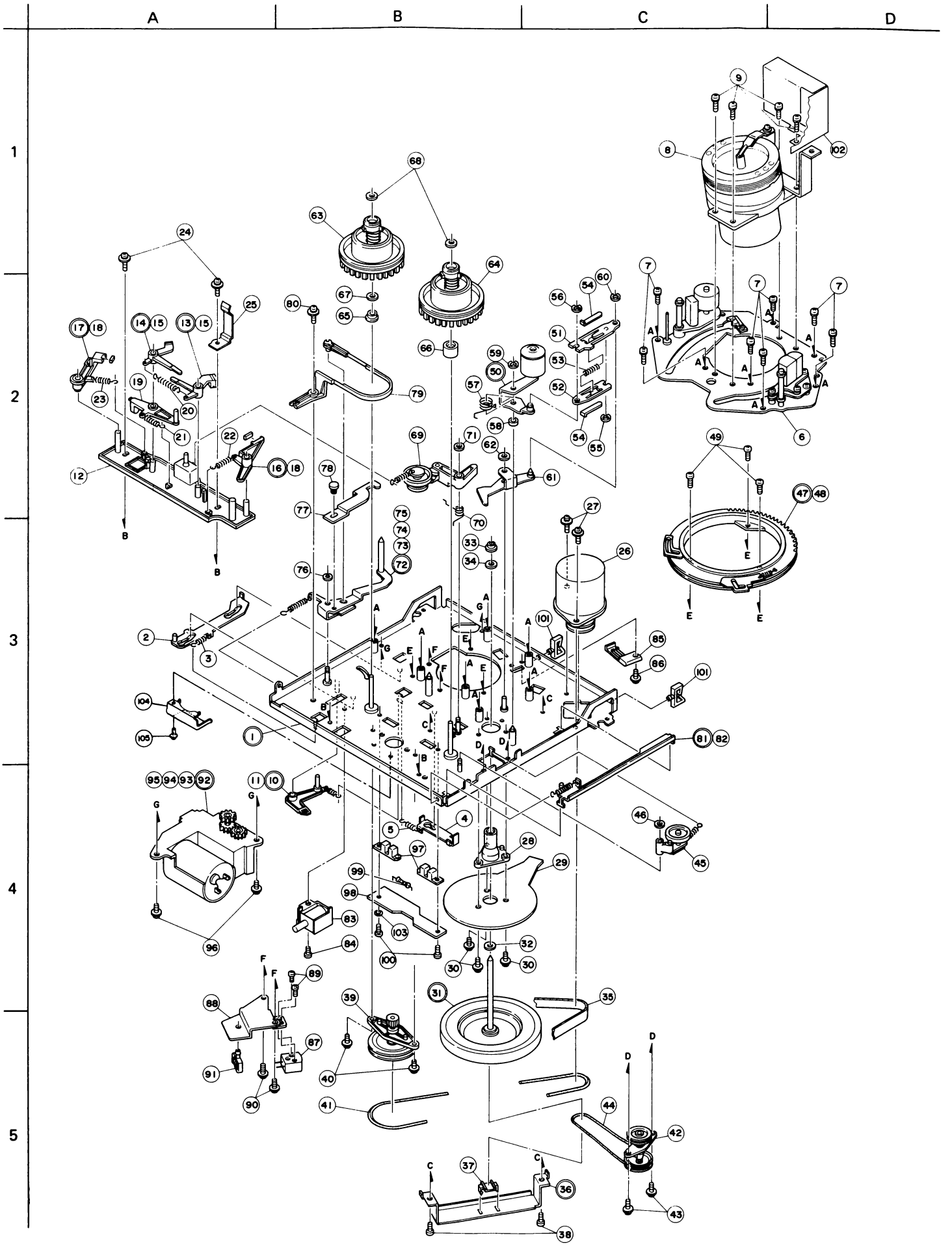
Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
⚠ 1	PQ10020C	Front Cover Assembly	Incl. (24) ~ (39) E	1	3-A 4-B
⚠	PQ10020B	"	" EG	1	3-A 4-B
2	SDSA3010Z	Tapping Screw		1	3-B
⚠ 3	PQ10014-2	Connector Panel	E	1	2-C 3-C
⚠	" -3	"	EG	1	2-C 3-C
4	SDSA3010Z	Tapping Screw		1	2-C
⚠ 5	PQ10015	Bottom Plate		1	5-B,C
6	SDSA3010Z	Tapping Screw		6	5-B,C
7	PQ30061	Plate	E	1	3-D
	" -2	"	EG	1	3-D
8	PQ40116	VR Knob		2	4-B
9	PQ30062	Switch Plate		1	3-B 4-B
10	PQ30122	Plate	E	1	3-B
	" -14	"	EG	1	3-B
11	PQ30052	Switch Cover		1	4-B
12	PQ40199	Switch Plate		1	4-C
⚠13	PQ10013	Top Cover		1	1-B,C 2-B,C
14	–	–		–	–
15	–	–		–	–
16	SXST3008R	Screw		5	1-B,C 2-C,D
⚠17	PU34316-17	Rating Label	E	1	2-C
⚠	PU34378-5	"	EG	1	2-C
18	PQ30107B	U. Door Assembly	Incl. (19)	1	2-A 3-A
19	PQ30117-2	Plate		1	2-A 3-A
20	PQ30030-2	L. Door		1	3-A
21	PQ40104-2	U. Spring		1	3-A
22	PQ40105	L. Spring		1	3-B
23	–	Screw	See Section 5.2.3	4	2-C 3-C
24	PQ30053	Display Glass	E	1	4-A
	" -2	"	EG	1	4-A
25	PQ30041	Push Button	CLOCK E	1	4-A
	" -2	"	" EG	1	4-A
26	PQ30044	"	RESET E	1	4-A
	" -2	"	" EG	1	4-A
27	PQ30063	"	COUNTER/LAP E	1	4-A
	" -2	"	" EG	1	4-A
28	PQ30097	"	COUNTER MEMORY E	1	4-A
	" -2	"	" EG	1	4-A
29	PUM30002-83	Spring	for MEMORY Button E	1	4-A
	" -59	"	" EG	1	4-A
30	PQ40112	Stopper	"	1	4-A
31	PQ30039	Push Button	INSTANT REC	1	4-A
32	PQ30040	"	CHANNEL	8	4-A
33	PQ30035	"	DAY	4	4-A
34	PQ30036	"	START	2	4-A
35	PQ30116	"	CLOCK SET	1	4-A
36	PUM30002-60	Spring	for Sym. No. (31) ~ (35)	16	4-A
37	PQ30050	Button Cover	for CHANNEL Button	1	4-A
38	PQ30064	Plate	for Sym. No. (33) ~ (35) E	1	4-A
	" -2	"	" EG	1	4-A
39	PQ20008-2	Door	E	1	4-A
	" -3	"	EG	1	4-A
40	SDST3008Z	Screw		1	2-C

5.2.3 Chassis assembly



– Chassis assembly list –

Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
⚠ 1	PQ10019A-3	Chassis Assembly	Incl. (2) ~ (4)	1	3-B,C 4-B,C
2	PQ40101	Foot		5	3-B,C 4-B,C
3	PQ31671	Hinge	for VIDEO & A/S/M	3	3-B,C 4-B,C
4	SDSA3010Z	Tapping Screw		3	3-B,C 4-B,C
5	PQ30056	Earth Bracket		1	4-B 5-B
6	SDSA3010Z	Tapping Screw		2	1-B
7	–	Mechanism Assembly	See Section 5.2.4	1	3-B
8	SDSA4012C	Tapping Screw		3	2-B 3-A,B
9	PU51817	Special Screw		2	2-B
10	PQ30110	Shield Plate		1	2-B
11	LPSP3006Z	Screw		1	2-B
12	PQ20010	Shield Cover		1	1-B
13	DPSP3008Z	Screw		1	1-B
14	–	–		–	–
15	–	Cassette Housing Assembly	See Section 5.2.7	1	2-A,B
16	SDSA3010Z	Tapping Screw		4	2-A,B
17	–	Power Trans. Board Assembly	See Section 6.2.1	1	4-C
18	–	Seesaw Switch	See Section 6.2.1	1	3-C
⚠ 19	SSSP3008Z	Screw		2	3-C
20	–	Power Transfomer	See Section 6.2.1	1	4-C
⚠ 21	SDSA4012C	Tapping Screw		4	4-D
22	PQ40191	Earth Bracket		1	3-D
23	SBSB3008Z	Tapping Screw		1	3-D
⚠ 24	PQ20011	Board Cover		1	3-C
25	–	Regulator Board Assembly	See Section 6.2.2	1	1-D 2-D
26	PQ30059	Board Supporter		2	1-C
27	SDSA3012Z	Tapping Screw		2	1-C
28	–	Audio/Servo/Mechacon Board Assembly	See Section 6.2.4	1	5-B
29	–	Operation Board Assembly	See Section 6.2.5	1	4-A
30	–	Video Board Assembly	See Section 6.2.3	1	1-B
31	DPSP3008Z	Screw		2	1-B
32	–	Timer/Pre-setter & T/T Sub Boards Assembly	See Section 6.2.7	1	4-A,B
33	–	–		–	
34	–	Tuner/IF Board Assembly	See Section 6.2.6	1	4-C
35	–	RF SW Board Assembly	See Section 6.2.9	1	3-D
36	SDSP3008M	Screw		3	4-C
37	–	Terminal Board Assembly	See Section 6.2.8	1	3-B,C
38	SDSA3010M	Tapping Screw		4	3-C
39	–	Connector Panel	See Section 5.2.2	1	3-C
40	PU55858A	Earth Bracket		1	2-B
41	SDSA3010Z	Tapping Screw		3	5-B,C
42	SDST3008Z	Screw		1	2-B
43	Q03093-502	Spacer		2	1-B
44	–	Mechacon Sub Board	See Section 6.2.10	1	2-C
45	PQ30181	Board Stopper		1	2-C

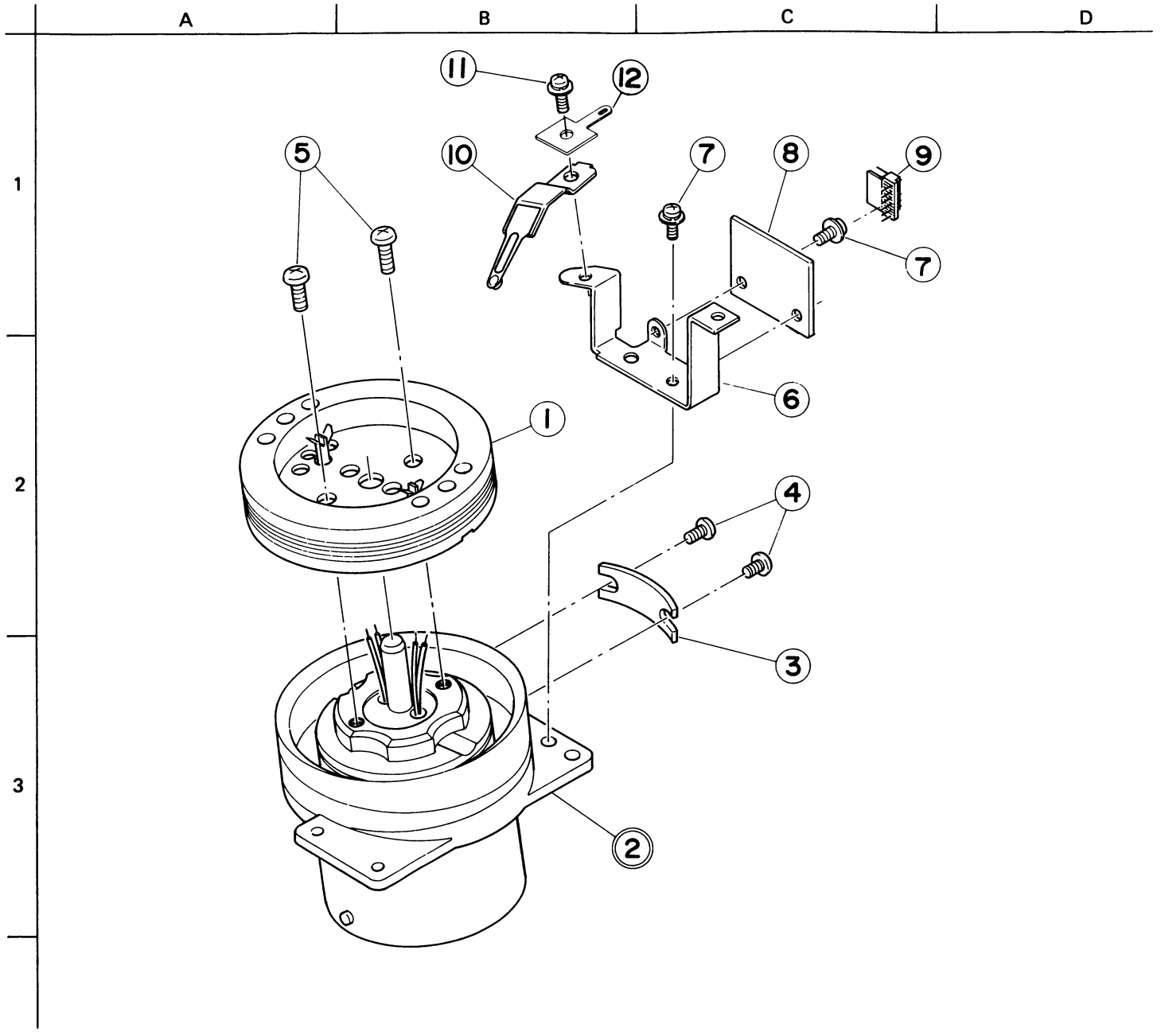

A
B
C
D
1
2
3
4
5

– Mechanism assembly list –

Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
1	PQ10017A	Main Deck Assembly	Incl. (2) ~ (5)	1	3-B,C
2	PQ40119A	Cancel Plate Assembly	Incl. (3)	1	3-A
3	PUM30001-114	Spring		1	3-A
4	PQ40123	Idler Plate		1	4-B
5	PUM30001-115	Spring		1	4-B
6	–	Sub deck Assembly	See Section 5.2.6	1	2-C,D
7	SDSP3008Z	Screw		7	2-C,D
8	–	Drum Assembly	See Section 5.2.5	1	1-C
9	LPSP3010Z	Screw		4	1-C
10	PQ40121A	Balance Lever Assembly	Incl. (11)	1	4-B
11	PUM30001-121	Spring		1	4-B
12	PQ20001	Mold Base		1	2-A
13	PQ40125A	Tension Brake Assembly	Incl. (15)	1	2-A
14	PQ40126A	Supply Brake Assembly	Incl. (15)	1	2-A
15	PU50670	Brake Shoe		2	2-A
16	PQ40127A	B.T. Brake Assembly (T)	Incl. (18)	1	2-A
17	PQ40128A	B.T. Brake Assembly (S)	Incl. (18)	1	2-A
18	PUM30019-2	Pad		2	2-A
19	PQ40058	Solenoid Arm		1	2-A
20	PUM30001-116	Spring		1	2-A
21	" -117	"		1	2-A
22	" -118	"		1	2-A
23	" -39	"		1	2-A
24	DPSP3008Z	Screw		2	2-A
25	PQ40173	Setting Plate		1	2-A
⚠ 26	PU55371V	Capstan Motor		1	3-C
27	DPSP3008Z	Screw		2	3-C
28	PQ30082A	Capstan Bearing		1	4-B
29	PU34275	FG Board		1	4-B,C
30	DPSP3010Z	Screw		3	4-B
31	PQ30083A	Flywheel Assembly	Incl. (32)	1	5-B,C
32	PUM30018-7	Spacer		1	4-B
33	PU52183	Capstan Oil Seal		1	3-B
34	PUM30018	Spacer		1	3-B
35	PUM30004	Belt		1	5-C
36	PQ40130A	Bracket Assembly	Incl. (37)	1	5-C
37	PU51783	Thrust Bearing		1	5-B
38	SPST3006Z	Tapping Screw		2	5-B,C
39	PU55372	Center Pulley		1	5-C
40	DPSP3008Z	Screw		2	4-B
41	PUM30003-7	Reel Belt		1	5-B
42	PU55373	Take-up Clutch		1	5-C
43	SPSP3006Z	Screw		2	5-C
44	PUM30003	Belt		1	5-C
45	PU51402	Take-up Idler Arm		1	4-C
46	PUM30017-8	Slit Washer		1	4-C
47	PQ30084A	Drive Ring Assembly	Incl. (48)	1	3-C,D
48	PUM30001-119	Spring		2	3-C,D
49	SDSP3008Z	Screw		3	3-C
50	PQ40134A	Pinch Roller Arm Assembly	Incl. (51) ~ (56)	1	2-C
51	PQ40139A	Spring Holder (1) Assembly		1	2-C
52	PQ40141	Spring Holder (2)		1	2-C
53	PUM30002-58	Spring		1	2-C
54	PU51385-1-1	Spacer		2	2-C
55	REE2500X	E-ring		1	2-C

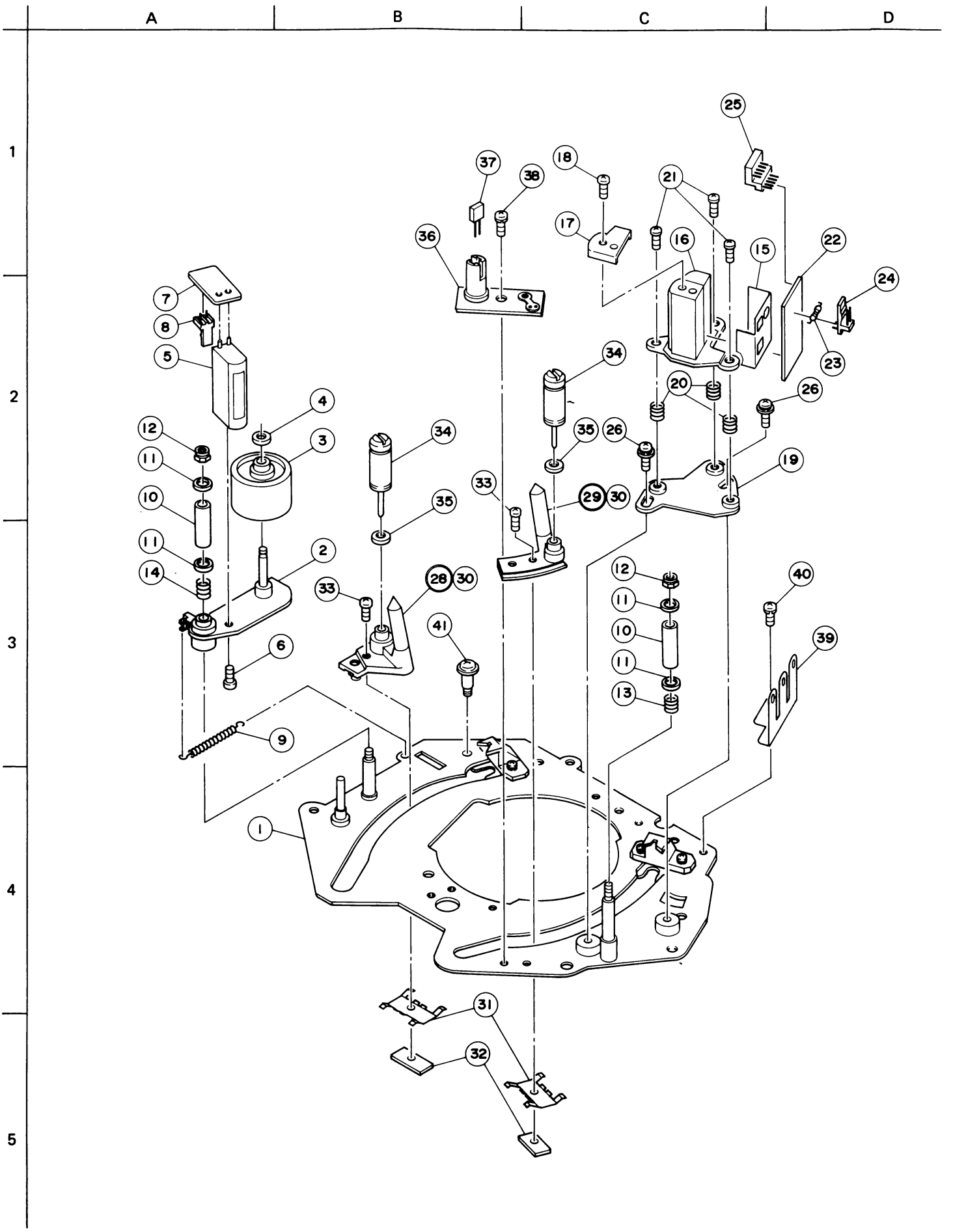
Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
56	REE3000X	E-ring		1	2-C
57	PQ40185	Spring		1	2-B
58	PUM30018-3	Spacer		1	2-B
59	REE5000	E-ring		1	2-B
60	REE2500X	"		1	2-C
61	PQ40142A	Play Lever Assembly		1	2-B
62	PUM30017-4	Slit Washer		1	2-B
63	PU48907D	S. Reel Disk Assembly		1	1-B
64	PU48907E	T. Reel Disk Assembly		1	2-B
65	PU45789-2	Collar		1	2-B
66	PU51550	"		1	2-B
67	Q03093-828	Washer		1	2-B
68	PUM30017-5	Slit Washer		2	1-B
69	PU55374-3	Reel Idler		1	2-B
70	PQ40145	Spring		1	2-B
71	PUM30017-8	Slit Washer		1	2-B
72	PQ40146A	Tension Arm Assembly	Incl. (73) ~ (75)	1	3-B
73	PU44852-3	Tension Pole		1	3-B
74	SSSP2605Z	Screw		1	3-B
75	PUM30001-50	Spring		1	3-B
76	PUM30017-5	Slit Washer		1	3-B
77	PU52269	Stopper		1	2-B
78	E48729-009	Plastic Rivet		1	2-B
79	PU51390A	Tension Band Assembly		1	2-B
80	DPSP3008Z	Screw		1	2-B
81	PQ40148A	Connect Plate Assembly	Incl. (82)	1	4-C
82	PUM30001-120	Spring		1	3-C,4-C
⚠ 83	PU55375	Solenoid		1	4-B
84	LPSP3006Z	Screw		1	4-B
85	PU55376	Leaf Switch		1	3-C
86	DPSP3006Z	Screw		1	3-C
87	PU55174	Pick-up Head	or PU55174-2	1	5-B
88	PQ40152	Bracket		1	5-B
89	SPSP2003Z	Screw		2	4-B
90	DPSP3006Z	"		2	5-B
91	PU55379	Mini Clamp		1	5-B
92	PU51859C	Drive Gear Assembly	Incl. (93) ~ (95)	1	4-A
⚠ 93	PU54304M	Motor Assembly		1	4-A
94	PUM30003-8	Loading Belt		1	4-A
95	QCF71HP-473	Ceramic Capacitor		1	4-A
96	DPSP3008Z	Screw		2	4-A
97	GP-3A06	Photo Interupter		2	4-B
98	PU55016	Reel Sensor Board		1	4-B
99	QRD167J-681	Carbon Resistor		1	4-B
100	SPSP3008Z	Tapping Screw		2	4-B
101	PU43147	Wire Clamp		2	3-C
102	PQ40175	Shield Case		1	1-D
103	Q03095-205	Washer		1	4-B
104	PQ40369	Wire Guard		1	3-A
105	LPSP3006Z	Screw		1	3-A

5.2.5 Drum assembly



– Drum assembly list –

Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
1	PU31332L	Upper Drum Assembly		1	2-A,B
⚠ 2	PUS36293L-7	Lower Drum Assembly	Incl. (3) and (4)	1	3-B
3	PU48700-7	Heater Assembly	or PU48700-8	1	2-C
4	SDBP3004N	Screw		2	2-C
5	NDBP3010N	"		2	1-A,B
6	PQ40155	Bracket		1	1-B,2-C
7	DPSP3006Z	Screw		2	1-C
8	PU55309	Head Conn. Board		1	1-C
9	PU43351-106	Cap Housing		1	1-C
10	PU48678A	Brush Assembly		1	1-B
11	DPSP3006Z	Screw		1	1-B
12	PU55669	Earth Lug		1	1-B


A
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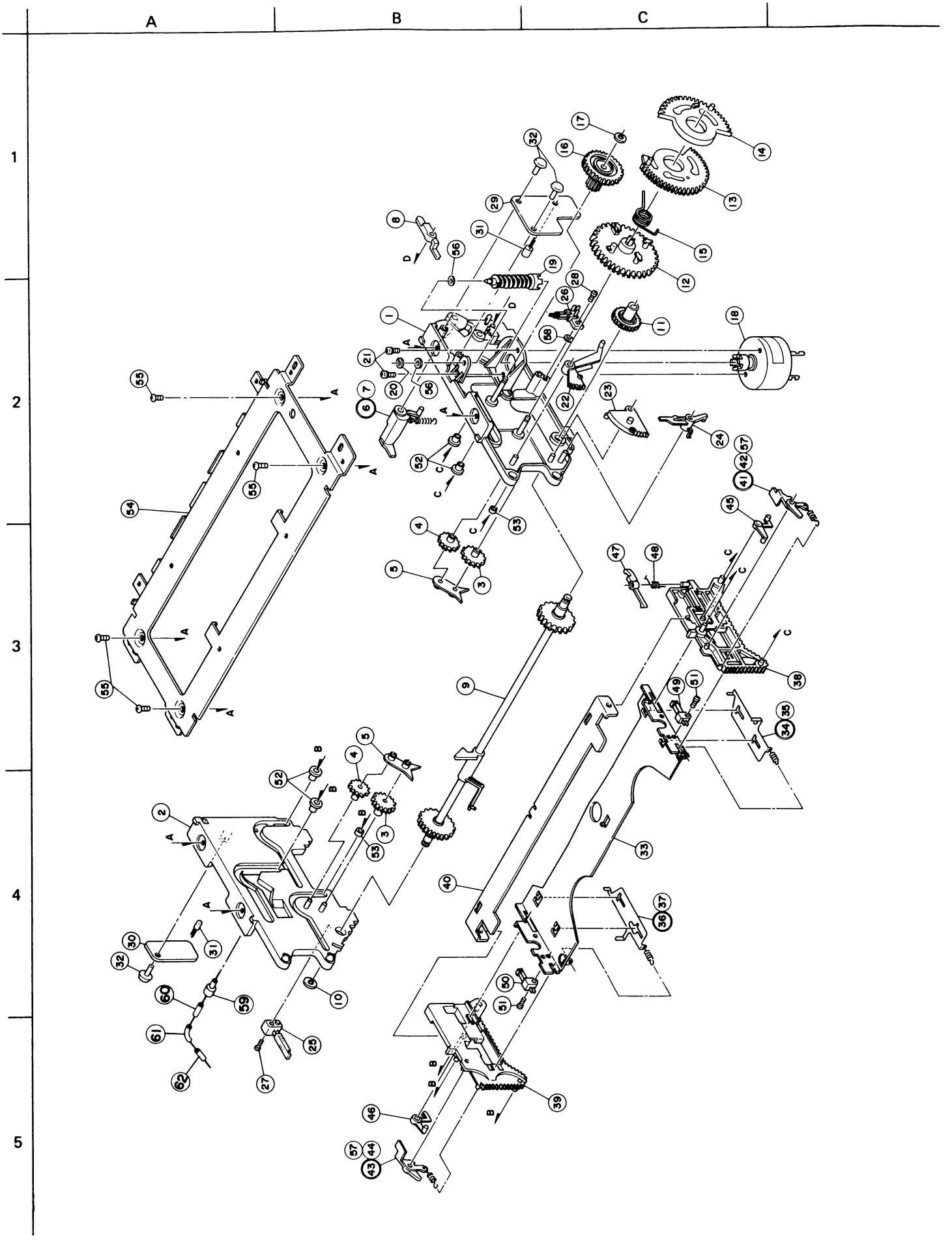
– Sub deck assembly list –

Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
1	PUS46182B	Sub Deck Assembly		1	4-B,C
2	PU52847A-3	E.H. Arm Sub Assembly		1	3-A
3	PU51292A	Roller Assembly		1	2-A
4	PUM30017	Slit Washer		1	2-A
5	PU51263-2	Full Erase Head	or PU51263-3	1	2-A
6	LPSP2004Z	Screw		1	3-A
7	PU55308	F.E. Head Board		1	2-A
8	PU43351-2	Cap Housing	CN1	1	2-A
9	PUM30001-124	Spring		1	3-A
10	PU53826	Guide Pole		2	3-A
11	PU51294	Guide Flange		4	2-A,3-A,3-C
12	PU49276	Nut		2	2-A,3-C
13	PU30080-49	Spring		1	3-C
14	PU30080-69	"		1	3-A
15	PU52110	Shield Cover		1	2-C
16	PU51262-4	Audio/Control Head Assembly	or PU51262-3	1	2-C
17	PU54165	Shield Cap		1	1-C
18	HPSP1714N	Screw		1	1-C
19	PU51296A	Base Assembly		1	2-C
20	PU30080-49	Spring		3	2-C
21	SPSP2608Z	Screw		3	1-C
22	PU55141	Audio/Control Head Board		1	2-D
23	QRD167J-100	Carbon Resistor		1	2-D
24	PU43351-102	Cap Housing	CN3	1	2-D
25	PU51260-5	"	CN1	1	1-C
26	DPSP3006Z	Screw		2	2-C
27	–	–		–	–
28	PQ40171A-1	S. Pole Base Assembly	Incl. (30)	1	3-B
29	PQ40172A-1	T. Pole Base Assembly	Incl. (30)	1	3-B
30	YFS3002.5FS	Set Screw		2	3-B
31	PU51299-2	Spring Plate		2	5-B
32	PU51638	Plate		2	5-B
33	SPSP2606Z	Screw		2	3-B
34	PU48748B	Guide Roller Assembly		2	2-B,C
35	PU48806-3	Rubber Tire		2	3-B
36	PQ30101A	LED Holder Assembly		1	2-B
37	GL-450	LED		1	1-B
38	LPSP3004Z	Screw		1	1-B
39	PU55492	Earth Lug		1	3-C
40	LPSP3006Z	Screw		1	3-C
41	PU54648	Flange Screw		1	3-B

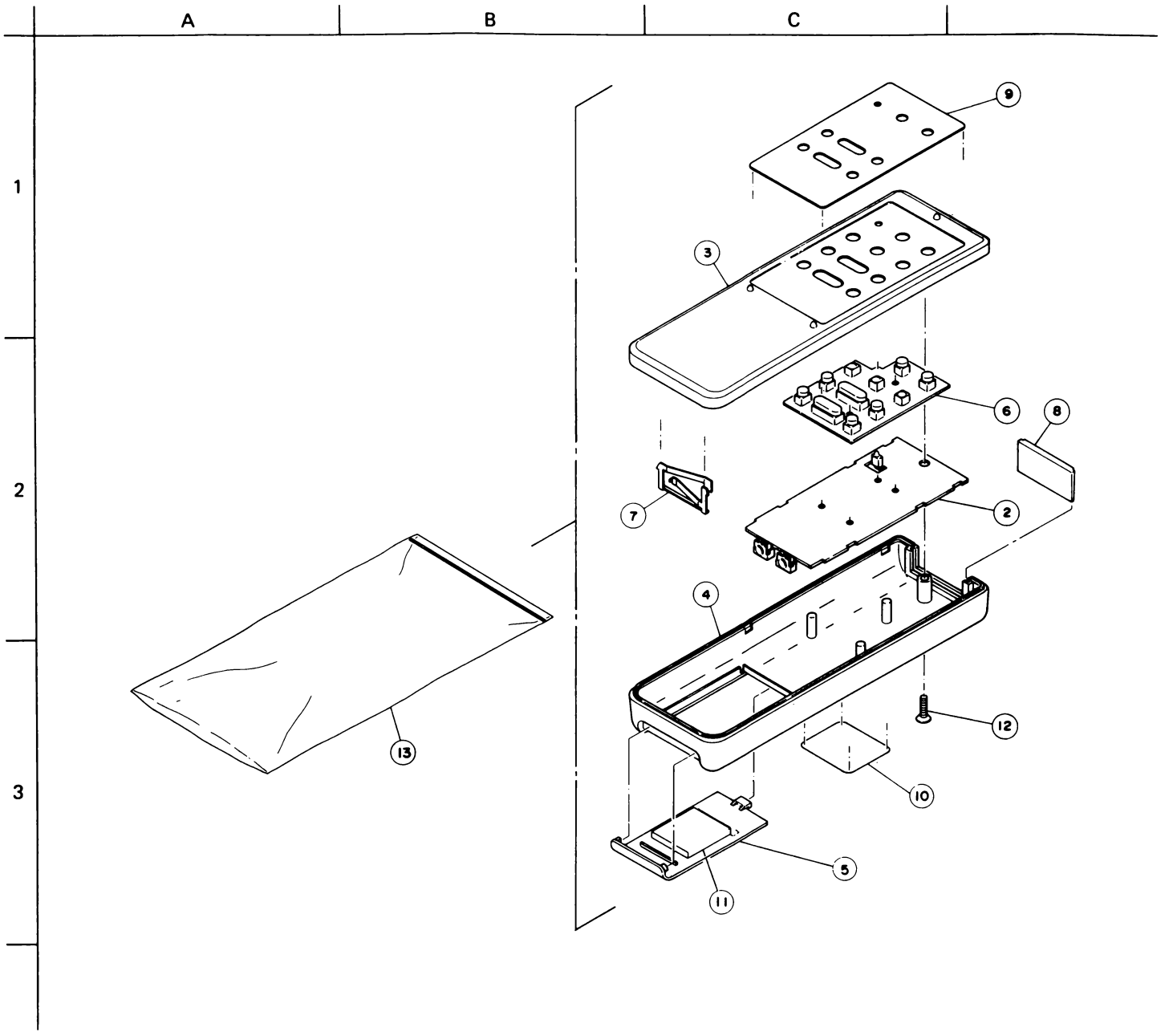
5.2.7 Cassette housing assembly



— Cassette housing assembly list —

Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
1	PQ30033A	R. Guide Stay Assembly		1	2-B,C
2	PQ10008	L. Guide Stay		1	4-B
3	PQ40059	Gear (1)		2	3-B 4-B
4	PQ40060	Gear (2)		2	3-B 4-B
5	PQ40061	Double Cap		2	3-B
6	PQ40102A	Door Guide Assembly	Incl. (7)	1	2-B
7	PUM30001-111	Spring		1	2-B
8	PQ40063	Guide Lever		1	1-B
9	PQ40103A	Connect Gear Assembly		1	3-C
10	PUM30017-11	Slit Washer		1	4-B
11	PQ40065	Cam Gear (2)		1	2-C
12	PQ30028	Cam Gear (1)		1	1-C
13	PQ40066	L. Slide Gear		1	1-C
14	PQ40067	UL. Slide Gear		1	1-C
15	PQ40068-2	Limiter Spring		1	1-C
16	PQ40069	Worm Wheel		1	1-C
17	PUM30017-4	Slit Washer		1	1-C
⚠ 18	PQ40090A	Motor Assembly		1	2-D
19	PQ40091A	Worm Assembly		1	2-C
20	PUM30017	Slit Washer		1	2-B
21	LPSP2605Z	Screw		2	2-B
22	PQ40074	U. Door Opener		1	2-C
23	PQ40075	L. Door Opener		1	2-C
24	PQ40076	Hold Lever		1	2-C
25	PU51259-3	Leaf Switch		1	5-B
26	PU55377	End Switch		1	2-C
27	SPSP2010Z	Screw		1	5-B
28	SBSE2608Z	"		1	2-C
29	PU55109	Cassette Housing Board		1	1-C
30	PU55111	End Sensor Board		1	4-A
31	PT352VA	Photo Transistor	or PN202S-S1	2	1-C 4-A
32	PU48973-3	Stopper		3	1-C 4-A
33	PQ30031	Cassette Holder		1	3-C 4-C
34	PQ40106A	R. Slide Plate Assembly	Incl. (35)	1	3-D
35	PUM30001-113	Spring		1	3-D
36	PQ40107A-1	L. Slide Plate Assembly	Incl. (37)	1	4-C
37	PUM30001-113	Spring		1	4-C
38	PQ10009	R. Bracket		1	3-C,D
39	PQ10009-2	L. Bracket		1	5-B,C
40	PQ30032	Reinforcement		1	3-C 4-C
41	PQ40108A	R. Lock Lever Assembly	Incl. (42) and (57)	1	2-D
42	PUM30001-110	Spring		1	2-D
43	PQ40109A	L. Lock Lever Assembly	Incl. (44) and (57)	1	5-B
44	PUM30001-110	Spring		1	5-B
45	PQ40081A	R. Switch Lever Assembly		1	2-D
46	PQ40081B	L. Switch Lever Assembly		1	5-B
47	PQ40083	Lid Opener		1	3-C
48	PQ40084	Spring		1	3-C
49	PU55378	R. Insert Switch		1	3-C
50	PU55378-2	L. Insert Switch		1	4-C
51	SPSP1704Z	Screw		2	3-C 4-C
52	PQ40086	Roller		4	2-B 4-B
53	PQ40087	Mini Roller		2	2-C 4-B
54	PQ20003	Roof Plate		1	2-A 3-A,B
55	SBSE2608Z	Screw		4	2-A 2-B 3-A
56	Q03093-838	Spacer		2	1-B 2-B
57	PUM30019-5	Pad		2	2-D 5-B
58	WNB3000	Washer		1	2-C
59	PQ40299	Wire Cap		1	5-A
60	QXT629H-020	UL. Tube		1	5-A
61	QXT329H-035	"		1	5-A
62	QXTF253-020	"		1	5-A
—	PUS26805B	Cassette Housing Assembly	Incl. (1) ~ (62)	—	—

5.2.8 Remote control unit



– Remote control unit list –

Symbol No.	Part No.	Part Name	Description	Q'ty	Symbol No. Position
⚠ 1	PU34245	Remote Control Unit	Incl. (2) ~ (13) E	1	–
⚠	" -21	"	" EG	1	–
2	–	Remote Control Board Assembly	See Section 6.2.11	1	3-B
3	PU34245-005	Upper Case		1	2-A,B
4	" -006	Bottom Case		1	3-A,B
5	" -007	Battery Cover		1	4-A,B
6	" -008	Key-top Rubber		1	2-B
7	" -012	Electrode Plate		1	3-A
8	" -015	Window		1	3-B
9	" -027	Panel	E	1	2-B
	" -046	"	EG	1	2-B
10	" -028	Label		1	3-B
11	" -029	Damper		1	4-A
12	SSSF2612M	Tapping Screw		1	3-B
13	PU34245-016	Poly Bag		1	2-C

SECTION 6
ELECTRICAL PARTS LIST

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SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

ABBREVIATIONS IN THIS LIST ARE AS FOLLOWS:

RESISTORS – All resistance values are in ohms (Ω).

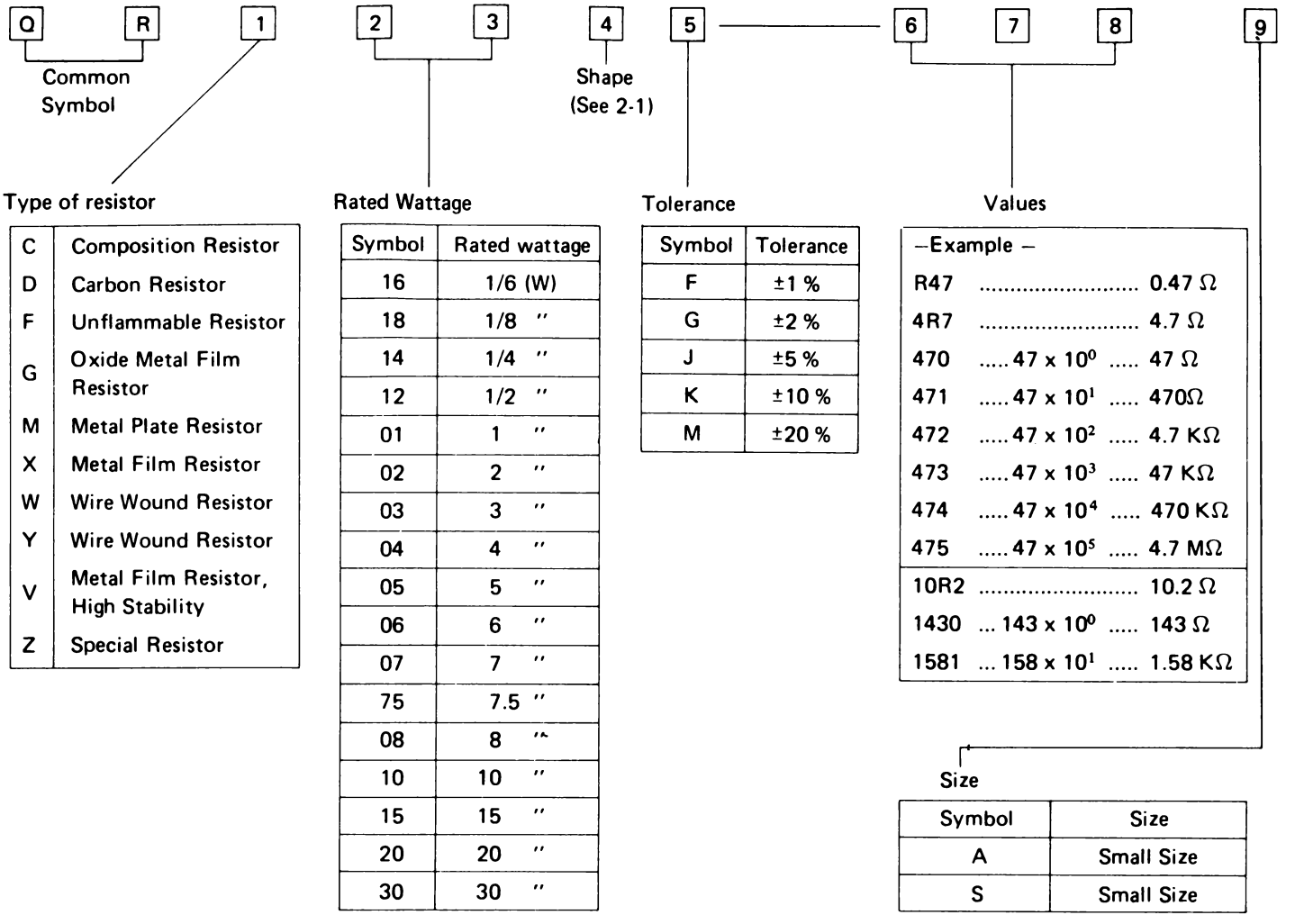
K	: 1 000
M	: 1 000 000
CR	: Carbon Resistor
Comp. R	: Composition Resistor
WR	: Wire Wound Resistor
OMR	Oxide Metal Film Resistor
VR	Variable Resistor (Potentiometer)
MFR	Metal Film Resistor
FR	Fusible Resistor

CAPACITORS – All capacitance values are in μF, unless otherwise indicated.

P	μμF
C Cap	Ceramic Capacitor
E Cap	Electrolytic Capacitor (L. L : Low Leakage)
FM Cap	: Film Mica Capacitor
MM Cap	: Metalized Mylar Capacitor
MP Cap	: Metalized Paper Capacitor
MY Cap	: Mylar Capacitor
NP Cap	Non-polar Capacitor
PC Cap	: Polycarbonate Capacitor
PP Cap	: Poly Pro Capacitor
PS Cap	: Polystyrol Capacitor
T Cap	: Tantalum Capacitor
TR Cap	: Trimmer Capacitor

6.1 STANDARD PART NUMBER CODING

6.1.1 Fixed Resistor Coding



C	Composition Resistor
D	Carbon Resistor
F	Unflammable Resistor
G	Oxide Metal Film Resistor
M	Metal Plate Resistor
X	Metal Film Resistor
W	Wire Wound Resistor
Y	Wire Wound Resistor
V	Metal Film Resistor, High Stability
Z	Special Resistor

Symbol	Rated wattage
16	1/6 (W)
18	1/8 "
14	1/4 "
12	1/2 "
01	1 "
02	2 "
03	3 "
04	4 "
05	5 "
06	6 "
07	7 "
75	7.5 "
08	8 "
10	10 "
15	15 "
20	20 "
30	30 "

Symbol	Tolerance
F	±1 %
G	±2 %
J	±5 %
K	±10 %
M	±20 %

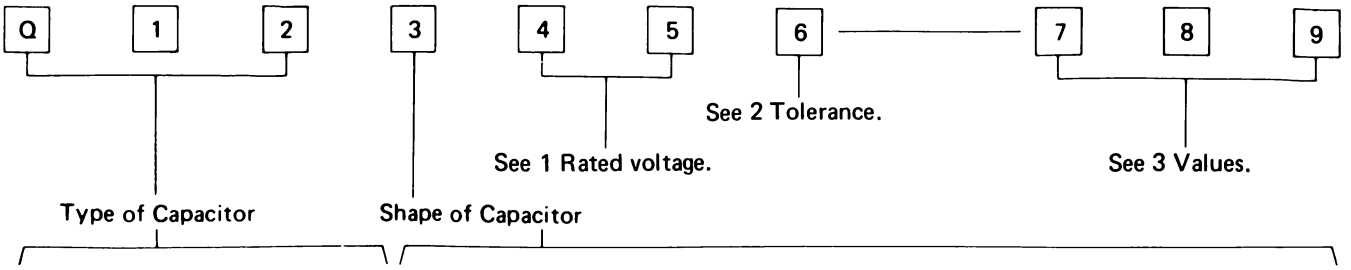
–Example –		
R47	.....	0.47 Ω
4R7	.....	4.7 Ω
470	.....47 x 10^0	47 Ω
471	.....47 x 10^1	470Ω
472	.....47 x 10^2	4.7 KΩ
473	.....47 x 10^3	47 KΩ
474	.....47 x 10^4	470 KΩ
475	.....47 x 10^5	4.7 MΩ
10R2	.....	10.2 Ω
1430	...143 x 10^0	143 Ω
1581	...158 x 10^1	1.58 KΩ

Symbol	Size
A	Small Size
S	Small Size

2-1 Shape of resistor (■ : Flame retardant resistor)

Sort	C	D	G	F	M	W	X	Y	V
1									
2									
3									
4									
5						L type			
6						Resin Covered			
7						Enameled			
8									
9									

6.1.2 Fixed Capacitor Coding



Ceramic Capacitors

Symbol	Type of Capacitor	Disk Lead	Kink Lead			
QCC	Ceramic			4	5	
QCF	"	1	3			
QCS	"	1	3			
QCX	"			1	3	
QCY	"	1.4	3			
QCT	Temperature compensation					
QCZ	Special					

Electrolytic Capacitors

Symbol	Type of Capacitor	Tubular	Mono-direction	Anti-stress	Forming	Snap-in
QEA	Characteristic A	2	4			
QEB	Low Leakage		4	5	6	
QED	Characteristic D	2	4			
QEE	Tantalum		4	5		
QEE	" (small type)		8			
QEL	Characteristic L					7
QEN	Non-polar	2	4	5	6	
QEW	Characteristic W	2	4	5	6	7
QET	Characteristic W (small type)	2	4	5	6	
QEK	Characteristic W (subminiature type)		4	5		
QEZ	Special					

Paper Film Capacitors

Symbol	Type of Capacitor	Tubular	Normal		Flame retardant	
			Mono-direction	Kink Lead	Mono-direction	Kink Lead
QFF	Film mica		4			
QFH	Metalized mylar	2	4	3	5	6
QFM	Mylar	2	4	3,7	5	6
QFN	" (small type)		4			
QFP	Polypropylene		4	3		
QFS	Polystyrole	2	4	3		
QFZ	Special					

1 Rated voltage (V)

First letter \ 2nd letter	A	B	C	D	E	F	G	H	J	K	V	W	X
0						3.15			6.3				
1	10		16	20	25		40	50	63		35		
2	100	125	160	200	250	315	400	500	630		350	450	600
3	1000	1250		2000				5000					

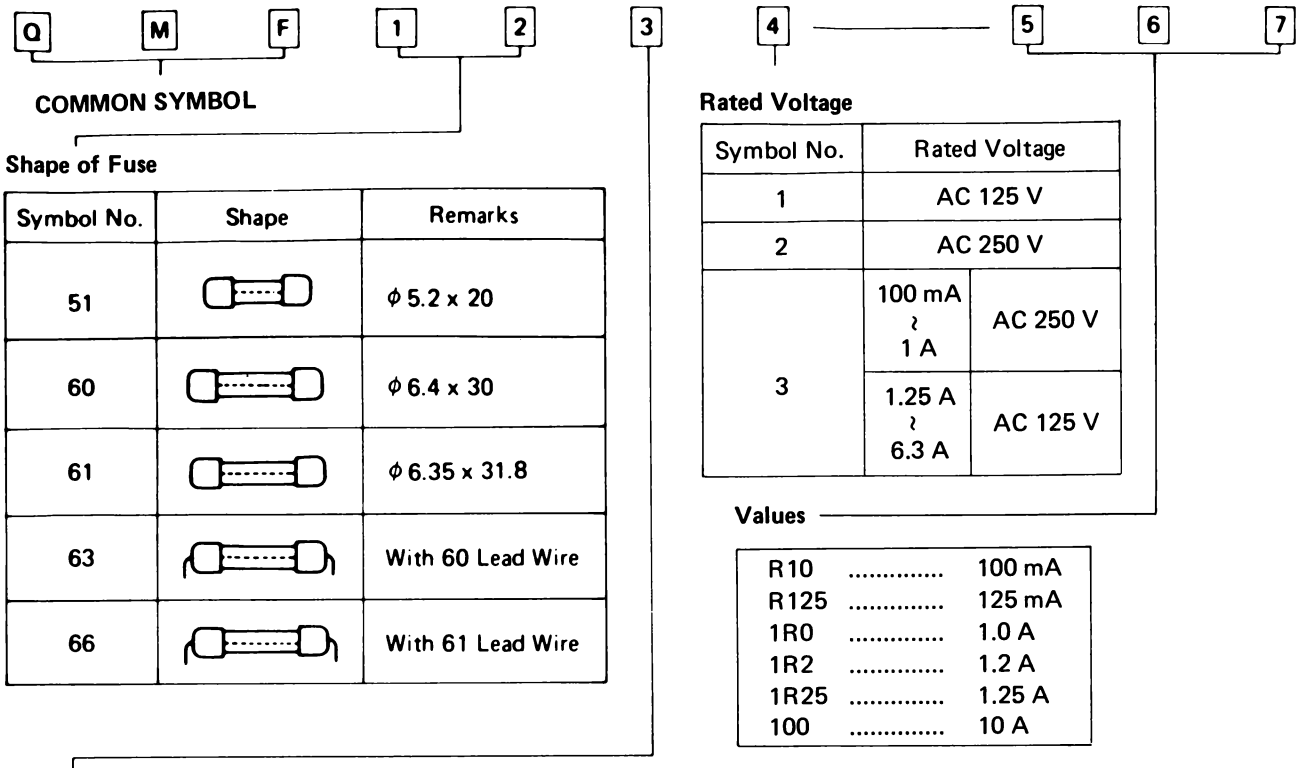
2 Tolerance

Symbol	F	G	J	K	M	N	Z	P	A	H	R
(%)	± 1	± 2	± 5	± 10	± 20	±30	+ 80 − 20	+ 100 − 0	+ 100 − 10	+ 50 −10	+ 30 −10

3 Values

– Example –	Values are in picofarads.
101	10×10^1 ..... 100 pF
102	10×10^2 ..... 1,000 pF
103	10×10^3 ..... 10,000 pF = 0.01 μF
104	10×10^4 ..... 100,000 pF = 0.1 μF
5R0	5.0 ..... 5 pF

6.1.3 Fuse Coding



Symbol No.	Shape	Remarks
51		φ 5.2 x 20
60		φ 6.4 x 30
61		φ 6.35 x 31.8
63		With 60 Lead Wire
66		With 61 Lead Wire

Symbol No.	Rated Voltage	
1	AC 125 V	
2	AC 250 V	
3	100 mA ≀ 1 A	AC 250 V
	1.25 A ≀ 6.3 A	AC 125 V

R10	.....	100 mA
R125	.....	125 mA
1R0	.....	1.0 A
1R2	.....	1.2 A
1R25	.....	1.25 A
100	.....	10 A

Symbol No.	Fusing current	Fusing time	Remarks
S	160%	Within 1 hr.	Anti-rush Type
	200%	" 2 min.	
	700%–2000%	" 0.01 sec.	
R	160%	" 1 hr.	Regular Fusible Type
	200%	" 2 min.	
M	135%	" 1 hr.	Regular Fusible Type (for UL)
	200%	" 2 min.	
U	135%	" 1 hr.	Anti-rush Type (for UL)
	200%	" 2 min.	
	800%–2000%	" 0.01 sec.	
A	210%	" 2 min.	Anti-rush Type (for Europe)
	275%	0.5 – 10 sec.	
	400%	0.15 – 2 sec.	
	1000%	0.02 – 0.3 sec.	
B	210%	Within 30 min.	Regular Fusible Type (for SEMKO, Europe)
	275%	0.05 – 2 sec.	
	400%	0.01 – 0.3 sec.	
C	135%	Within 1 hr.	Anti-rush Type (for UL, Japan)
	200%	" 2 min.	

6.2 ELECTRICAL PARTS LIST BY ASSEMBLIES

6.2.1 Power Trans Board Ass'y [0][1] PU34095C

Symbol No.	Part No.	Part Name	Description
⚠ C1	QFE52EM-223	MM Cap	
⚠ S1	QSE1135-007	Seesaw Switch	
⚠ F1	QMF51A2-R50	Fuse	Not included in circuit board ass'y (PU34095C)
⚠	PU50479	Seesaw Switch Cover	
⚠	PU55262	Power Transformer	
⚠	QMP3960-200C	Power Cord Ass'y	
⚠	PU51212	Fuse Holder	for F1
⚠	A74316	Tab	
⚠	PU43192-4	Binder	

6.2.2 Regulator Board Ass'y [0][2] PU21640A-M

Symbol No.	Part No.	Part Name	Description
⚠ IC1	TA78012AP	Integrated Circuit	12 V REG.
Q1	–	–	
Q2	2SD637Q,R,S	Transistor	
⚠ Q3	2SD880O,Y,GR	"	
Q4	–	–	
⚠ Q5	2SD1128-08	Transistor	
Q6	2SD637Q,R,S	"	or 2SC2021Q, R,S
Q7	–	–	
⚠ Q8	2SA1020O,Y	Transistor	
Q9	–		
Q10	2SC2655O,Y	Transistor	
D1	30D2FC	Diode	or S3V20F
D2	"	"	"
D3	"	"	"
D4	10E2	"	
D5	"	"	
D6	30D2FC	"	or S3V20F
D7	MA150	"	
⚠ D8	HZ12C3L	Zener Diode	
D9	HZ6A2L	"	
⚠ D10	RD11EB	"	or RD12EB3
D11	11E2	Diode	or ERA12-01V3
⚠ D12	HZ30-2L	Zener Diode	
D13	–		
D14	11E2	Diode	or ERA12-01V3
D15	"	"	"
⚠ D16	1SS133	"	
⚠ D17	"	"	
⚠ D18	RD11EB1	Zener Diode	or RD11EB2,3
⚠ D19	11E2	Diode	
⚠ D20	"	"	
⚠ D21	HZ12C2	Zener Diode	
R1	QRD181J-333	CR	
R2			
R3	QRD182J-272	CR	
R4	" -222	"	
R5	" -222	"	
R6	" -681	"	
R7	" -681	"	
R8	QVZ3244-102	VR	9.3 V ADJ
R9	QRD181J-222	CR	
R10	–	–	
R11	–	–	
R12	QRD181J-272	CR	
R13	QRD121K-122	"	
R14	QRD181J-472	"	
R15	" -103	"	
⚠ C1	QCF32HP-103	C Cap	
⚠ C2	" -103	"	
⚠ C3	" -103	"	
⚠ C4	" -103	"	
⚠ C5	" -103	"	
⚠ C6	" -103	"	
⚠ C7	" -103	"	
C8	QEV71VR-108	E Cap	
C9	QET61VM-476	"	
C10	QFN31HK-103	M Cap	
C11	QEL71VR-338	E Cap	
C12	QET61VM-476	"	
⚠ C13	QFN31HK-103	M Cap	
C14	QET61EM-107	E Cap	
C15	QFN31HK-224	M Cap	
C16	QET61EM-476	E Cap	
⚠ C17	QCF32HP-103	C Cap	
C18	QET61HM-107	E Cap	
C19	QCS31HJ-101	C Cap	
C20	QET61HM-336	E Cap	
⚠ C21	" -107	"	
⚠ C22	QCF32HP-103	C Cap	
⚠ C23	" -103	"	
C24	QET62AM-226	E Cap	
C25	" -226	"	
⚠ C26	QCF11HP-102	C Cap	
RY1	PU51258-2	Relay	or PU55007
CN1	PU50597-4	Cap Housing	
CN2	PU43351-8	"	
CN3	" -3	"	
CN4	" -3Y	"	
CN5	" -4	"	
CN6	" -2	"	
	PU45908-3	Test Pin	TP1-TP6
⚠	PU51212	Fuse Holder	for F2,F3
	PU55370	Transistor Holder	for IC1,Q3
⚠	PQ30114	Radiator	
	PU45375	Transistor Spacer	for Q3,Q5
	PU41624-6	Washer	for Q5
	LPSP3006Z	Screw	"
	DPSP3006Z	"	for Radiator
	LPSP3010Z	"	for IC1,Q3
	A74017	Tab	
⚠	PU43092	Collor	for D12
⚠ F2	QMF51A2-2R5	Fuse	Not included in circuit board ass'y (PU21640A-M)
⚠ F3	" -R315	"	

6.2.3 Video Board Ass'y [0][3] PU10701A

Symbol No.	Part No.	Part Name	Description
IC101	M51454L	Integrated Circuit	
IC102	HA11738	〃	
⚠ IC103	HA11724	〃	
⚠ IC401	HA11741	Integrated Circuit	
IC402	BA7007	〃	
IC501	BA7001	Integrated Circuit	
⚠ IC502	BA7004	〃	
Q101	2SC2021Q,R,S	Transistor	
Q102	2SB641Q	〃	
Q103	2SC2021Q	〃	
Q104	2SC2021Q,R,S	〃	
Q105	〃	〃	
Q106	2SC2021Q	〃	
Q107	2SC2021Q,R,S	〃	
Q108	〃	〃	
Q109	〃	〃	
Q110	〃	〃	
Q111	〃	〃	
Q112	2SC2021Q	〃	
Q113	〃	〃	
Q114	2SK381C	F.E.T.	
Q115	2SC2021Q,R,S	Transistor	
Q116	〃	〃	
Q117	2SC2021Q	〃	
Q118	2SC2021Q,R,S	〃	
Q119	〃	〃	
Q120	2SC2021Q	〃	
Q121	2SC2021S	〃	
Q122	2SC2021Q,R,S	〃	
Q123	〃	〃	
Q124	DTC124F	〃	
Q125	2SB641Q	〃	
Q126	2SC2021Q,R,S	〃	
Q127	〃	〃	
Q128	〃	〃	
Q129	〃	〃	
Q130	2SA874Q,R	〃	
Q131	2SC1652Q,R	〃	
Q132	2SC2021Q,R,S	〃	
Q401	—	—	
Q402	DTC124F	Transistor	
Q403	2SC2021Q,R,S	〃	
Q404	〃	〃	
Q405	2SC2021Q	〃	
Q406	DTC124F	〃	
Q407	2SC2021Q,R,S	〃	
Q408	DTC124F	〃	
Q409	2SC2636T	〃	
Q410	2SC2021Q,R,S	〃	
Q411	2SC2021Q	〃	
Q412	2SC2021Q,R,S	〃	
Q413	〃	〃	
Q414	DTC124F	〃	
⚠ Q501	2SB641S	Transistor	
⚠ Q502	〃	〃	
⚠ Q503	〃	〃	
⚠ Q504	〃	〃	
Q505	—	—	
Q506	—	—	

Symbol No.	Part No.	Part Name	Description
Q507	2SC2021Q,R,S	Transistor	
Q508	〃	〃	
Q509	〃	〃	
Q510	〃	〃	
Q511	〃	〃	
Q512	DTC124F	〃	
Q513	2SB643S	〃	
Q514	DTC124F	〃	
D101	1SS133	Diode	
D102	〃	〃	
D103	MA150	〃	
D104	MA27TB	〃	
D105	1SS133	〃	
D106	〃	〃	
D107	〃	〃	
D108	〃	〃	
D109	〃	〃	
D110	〃	〃	
D111	MA150	〃	
D112	MA27TB	〃	
D113	MA27WA	〃	
D114	MA150	〃	
D115	〃	〃	
D401	1SS133	Diode	
D402	〃	〃	
D403	〃	〃	
D404	〃	〃	
D405	〃	〃	
D406	〃	〃	
D407	〃	〃	
D501	1SS133	Diode	
D502	〃	〃	
D503	—	—	
D504	1SS133	Diode	
D505	〃	〃	
D506	—	—	
D507	1SS133	Diode	
D508	〃	〃	
R101	QRD161J-821	CR	
R102	〃 -392	〃	
R103	〃 -392	〃	
R104	〃 -391	〃	
R105	〃 -391	〃	
R106	〃 -152	〃	
R107	〃 -222	〃	
R108	〃 -681	〃	
R109	QVZ1802-102	VR	Noise Cancel
R110	QRD161J-272	CR	
R111	〃 -223	〃	
R112	〃 -333	〃	
R113	〃 -102	〃	
R114	〃 -391	〃	
R115	〃 -683	〃	
R116	〃 -561	〃	
R117	〃 -472	〃	
R118	〃 -182	〃	
R119	〃 -391	〃	
R120	〃 -122	〃	
R121	〃 -152	〃	
R122	〃 -102	〃	
R123	〃 -152	〃	
R124	QVZ1802-222	VR	PB Y Level

Symbol No.	Part No.	Part Name	Description
R125	QRD161J-102	CR	
R126	" -393	"	
R127	" -561	"	
R128	" -561	"	
R129	" -125	"	
R130	" -122	"	
R131	" -391	"	
R132	" -122	"	
R133	" -391	"	
R134	" -271	"	
R135	" -121	"	
R136	" -102	"	
R137	" -222	"	
R138	" -102	"	
R139	" -102	"	
R140	" -102	"	
R141	" -222	"	
R142	" -391	"	
R143	" -471	"	
R144	" -331	"	
R145	QVZ1802-681	VR	RF EQ
R146	QRD161J-681	CR	
R147	" -102	"	
R148	" -333	"	
R149	" -123	"	
R150	" -102	"	
R151	" -102	"	
R152	" -333	"	
R153	" -333	"	
R154	" -221	"	
R155	" -391	"	
R156	" -102	"	
R157	" -391	"	
R158	" -103	"	
R159	" -222	"	
R160	" -331	"	
R161	" -471	"	
R162	QVZ1802-473	VR	Sharpness Preset
R163	QRD161J-103	CR	
R164	" -333	"	
R165	" -332	"	
R166	" -273	"	
R167	" -102	"	
R168	QVZ1802-102	VR	E-E Lebel
R169	QRD161J-221	CR	
R170	" -472	"	
R171	" -183	"	
R172	" -332	"	
R173	" -273	"	
R174	" -332	"	
R175	–	–	
R176	QRD161J-394	CR	
R177	QRD182J-155	"	
R178	QRD161J-682	"	
R179	QVZ1802-222	VR	Deviation
R180	QRD161J-222	CR	
R181	" -272	"	
R182	" -102	"	
R183	" -224	"	
R184	" -122	"	
R185	" -472	"	
R186	QVZ1802-681	VR	W. Clip
R187	QRD161J-471	CR	
R188	" -563	"	
R189	" -222	"	

Symbol No.	Part No.	Part Name	Description
R190	QVZ1802-152	VR	D. Clip
R191	QRD161J-562	CR	
R192	" -103	"	
R193	" -391	"	
R194	" -682	"	
R195	" -682	"	
R196	" -123	"	
R197	" -221	"	
R198	" -681	"	
R199	" -332	"	
R200	QVZ3506-103	VR	CH-1Q
R201	" -103	"	CH-2Q
R202	QRD161J-681	CR	
R203	" -391	"	
R204	" -471	"	
R205	" -103	"	
R206	" -182	"	
R207	" -820	"	
R208	" -102	"	
R209	" -680	"	
R210	" -223	"	
R211	" -473	"	
R212	" -223	"	
R213	QVZ1802-102	VR	Rec FM Lebel
R214	QRD161J-222	CR	
R215	" -222	"	
R216	" -391	"	
R217	" -681	"	
R218	" -223	"	
R219	" -223	"	
R220	" -102	"	
R221	" -102	"	
R222	" -221	"	
R223	" -222	"	
R224	" -152	"	
R225	" -821	"	
R226	" -331	"	
R227	" -392	"	
R228	" -181	"	
R229	" -222	"	
R230	" -221	"	
R231	" -333	"	
R232	" -222	"	
R233	" -564	"	
R234	" -333	"	
R235	" -333	"	
R236	" -153	"	
R237	" -331	"	
R238	" -102	"	
R239	" -123	"	
R240	" -103	"	
R241	" -332	"	
R242	" -103	"	
R243	" -182	"	
R244	" -103	"	
R245	" -271	"	
R246	" -222	"	
R247	" -122	"	
R248	" -822	"	
R249	" -822	"	
R250	" -822	"	
R251	" -124	"	
R252	" -103	"	
R253	QVZ1802-152	VR	Carrier
R254	QRD161J-681	CR	

Symbol No.	Part No.	Part Name	Description
R255	ERT-D2ZHL-332S	Thermistor	
R256	QRD161J-272	CR	
R257	" -100	"	
R258	" -272	"	
R259	" -100	"	
R260	" -681	"	
R261	" -3R9	"	
R262	" -471	"	
R263	" -272	"	
R264	" -330	"	
R265	" -681	"	
R266	" -3R9	"	
R267	" -272	"	
R268	" -330	"	
R269	" -220	"	
R270	" -220	"	
R271	" -102	"	
R272	" -332	"	
R273	" -332	"	
R274	" -102	"	
R275	" -221	"	
R276	" -222	"	
R277	" -272	"	
R401	—	—	
R402	QRD161J-153	CR	
R403	—	—	
R404	QRD161J-222	CR	
R405	" -222	"	
R406	" -272	"	
R407	" -123	"	
R408	" -222	"	
R409	" -223	"	
R410	" -223	"	
R411	QVZ1802-472	VR	Rec Color
R412	QRD161J-562	CR	
R413	" -122	"	
R414	" -123	"	
R415	" -562	"	
R416	" -562	"	
R417	" -222	"	
R418	" -151	"	
R419	" -102	"	
R420	" -681	"	
R421	" -102	"	
R422	" -562	"	
R423	" -222	"	
R424	" -181	"	
R425	" -102	"	
R426	" -682	"	
R427	QVZ1802-682	VR	AFC
R428	QRD161J-821	CR	
R429	" -122	"	
R430	" -392	"	
R431	" -392	"	
R432	" -333	"	
R433	QRG129J-331	OMR	
R434	QRD161J-562	CR	
R435	" -151	"	
R436	" -122	"	
R437	QVZ1802-223	VR	VXO (2)
R438	QRD161J-562	CR	
R439	" -471	"	
R440	" -274	"	
R441	" -472	"	

Symbol No.	Part No.	Part Name	Description
R442	QRD161J-471	CR	
R443	" -472	"	
R444	" -471	"	
R445	" -123	"	
R446	QVZ1802-103	VR	Conv. Bal
R447	QRD161J-682	CR	
R448	" -564	"	
R449	" -102	"	
R450	" -102	"	
R451	" -272	"	
R452	QVZ1802-222	VR	PB. Col. Lev.
R453	QRD161J-103	CR	
R454	" -332	"	
R455	" -104	"	
R456	" -331	"	
R457	" -102	"	
R458	" -222	"	
⚠ R459	" -221	"	
R460	" -332	"	
R461	" -471	"	
R462	" -104	"	
R463	" -223	"	
R464	" -102	"	
R465	" -473	"	
R466	" -102	"	
R467	" -393	"	
R468	" -563	"	
R469	" -182	"	
R470	QVZ1802-472	VR	Secam DET
R471	QRD161J-102	CR	
R472	" -103	"	
R473	" -562	"	
R474	" -393	"	
R475	" -333	"	
R476	" -183	"	
R477	" -473	"	
R478	" -332	"	
R479	—	—	
R480	QRD161J-331	CR	
R501	QRD161J-682	CR	
R502	" -223	"	
R503	" -152	"	
R504	" -223	"	
R505	" -152	"	
R506	" -223	"	
R507	" -152	"	
R508	" -223	"	
R509	" -152	"	
R510	—	—	
R511	—	—	
R512	—	—	
R513	—	—	
R514	QRD161J-471	CR	
R515	" -681	"	
R516	" -102	"	
R517	—	—	
R518	QRD161J-750	CR	
R519	" -102	"	
R520	QRD182J-331	"	
R521	QRD161J-182	"	
R522	" -332	"	
R523	" -822	"	
R524	" -223	"	

Symbol No.	Part No.	Part Name	Description
R525	QRD161J-474	CR	
R526	" -182	"	
R527	" -471	"	
R528	" -222	"	
R529	" -123	"	
R530	" -123	"	
R531	" -221	"	
R532	" -103	"	
R533	" -221	"	
R534	" -223	"	
R535	" -104	"	
C101	QET61AR-476	E Cap	
C102	QCF31HP-223	C Cap	
C103	QET61HR-105	E Cap	
C104	QCS31HJ-101	C Cap	
C105	" -221	"	
C106	" -220	"	
C107	QET61AR-107	E Cap	
C108	QET61HR-105	"	
C109	QCF31HP-103	C Cap	
C110	" -103	"	
C111	QCT25CH-820	"	
C112	QET60JR-476	E Cap	
C113	QCS31HJ-330	C Cap	
C114	" -820	"	
C115	" -220	"	
C116	" -151	"	
C117	" -560	"	
C118	PU51163-161	"	
C119	" -181	"	
C120	QCF31HP-223	"	
C121	QET61AR-476	E Cap	
C122	QET61CR-106	"	
C123	QET61AR-476	"	
C124	QET60JR-476	"	
C125	QCF31HP-223	C Cap	
C126	QET61AR-476	E Cap	
C127	" -476	"	
C128	" -476	"	
C129	QCF31HP-223	C Cap	
C130	QCS31HJ-680	"	
C131	" -390	"	
C132	QET61AR-476	E Cap	
C133	QCF31HP-223	C Cap	
C134	" -223	"	
C135	QCS31HJ-180	"	
C136	" -560	"	
C137	" -471	"	
C138	QCF31HP-103	"	
C139	QCS31HJ-101	"	
C140	" -121	"	
C141	" -331	"	
C142	" -270	"	
C143	QEK61AM-476	E Cap	
C144	QCF31HP-223	C Cap	
C145	QET61AR-476	E Cap	
C146	QCS31HJ-820	C Cap	
C147	" -271	"	
C148	QET61CR-106	E Cap	
C149	QET61AR-476	"	
C150	QCF31HP-223	C Cap	
C151	QET60JR-476	E Cap	
C152	QET61ER-106	"	

Symbol No.	Part No.	Part Name	Description
C153	QCF31HP-103	C Cap	
C154	QCS31HJ-560	"	
C155	QET61AR-227	E Cap	
C156	QCS31HJ-330	C Cap	
C157	QCF31HP-223	"	
C158	QCS31HJ-560	"	
C159	QET60JR-227	E Cap	
C160	QCT25CH-820	C Cap	
C161	QCF31HP-223	"	
C162	QET60JR-107	E Cap	
C163	QET61CR-226	"	
C164	QET61HR-105	"	
C165	QCF31HP-223	C Cap	
C166	QFN31HJ-104	M Cap	
C167	QCS31HJ-471	C Cap	
C168	QET61HR-225	E Cap	
C169	QFN31HJ-682	M Cap	
C170	QET61AR-107	E Cap	
C171	QCS31HJ-330	C Cap	
C172	" -5R0	"	
C173	QCF31HP-223	"	
C174	QET61AR-476	E Cap	
C175	QCS31HJ-100	C Cap	
C176	QCF31HP-223	"	
C177	" -103	"	
C178	QET61ER-475	E Cap	
C179	QCT25CH-121	C Cap	
C180	QCS31HJ-180	"	
C181	" -120	"	
C182	" -181	"	
C183	QCF31HP-223	"	
C184	" -223	"	
C185	" -103	"	
C186	PU55357	Trimmer Cap	CH-1 f_0
C187	"	"	CH-2 f_0
C188	QCF31HP-103	C Cap	
C189	" -223	"	
C190	QET61HR-474	E Cap	
C191	QCF31HP-223	C Cap	
C192	QCS31HJ-181	"	
C193	QET61AR-476	E Cap	
C194	QCF31HP-223	C Cap	
C195	QCS31HJ-560	"	
C196	" -221	"	
C197	QCF31HP-223	"	
C198	QET61AR-476	E Cap	
C199	QCF31HP-103	C Cap	
C200	QCS31HJ-121	"	
C201	QCF31HP-223	"	
C202	QCS31HJ-121	"	
C203	" -120	"	
C204	QCF31HP-223	"	
C205	" -103	"	
C206	" -223	"	
C207	" -103	"	
C208	QET60JR-336	E Cap	
C209	QEN61AM-476	NP Cap	
C210	QET61AR-336	E Cap	
C211	QCF31HP-223	C Cap	
C212	QCS31HJ-331	"	
C213	QET61AR-476	E Cap	
C214	QCS31HJ-680	C Cap	
C215	QCF31HP-103	"	
C216	QCS31HJ-120	"	
C217	QET60JR-476	E Cap	

Symbol No.	Part No.	Part Name	Description
C218	PU51163-301	C Cap	
C219	" -511	"	
C220	QCF31HP-223	"	
C221	" -223	"	
C222	" -223	"	
C223	QET61CR-106	E Cap	
C224	QET61AR-476	"	
C225	QCF31HP-223	C Cap	
C226	QET61CR-106	E Cap	
C227	QCF31HP-223	C Cap	
C228	QFN31HJ-333	M Cap	
C229	" -333	"	
C230	QCF31HP-223	C Cap	
C231	QET61AR-476	E Cap	
C232	—	—	
C233	—	—	
C234	QCF31HP-223	C Cap	
C235	QET61AR-476	E Cap	
C236	QCS11HJ-470	C Cap	
C401	QCF31HP-223	C Cap	
C402	" -102	"	
C403	" -223	"	
C404	" -223	"	
C405	QET61AR-476	E Cap	
C406	" -476	"	
C407	QET61HR-225	"	
C408	QCF31HP-223	C Cap	
C409	" -103	"	
C410	" -103	"	
C411	QCF11HP-103	"	
C412	QCF31HP-103	"	
C413	QEK61HR-224	E Cap	
C414	QCF31HP-103	C Cap	
C415	" -103	"	
C416	QFN31HJ-332	M Cap	
C417	" -472	"	
C418	QCS31HJ-391	C Cap	
C419	QET61AR-107	E Cap	
C420	QEE51CM-475	T Cap	
C421	QET61ER-475	E Cap	
C422	QFN31HJ-104	M Cap	
C423	" -563	"	
C424	QET61CR-106	E Cap	
C425	QET61AR-476	"	
C426	QFN31HJ-473	M Cap	
C427	QET61ER-475	E Cap	
C428	QFN31HJ-223	M Cap	
C429	QCT25CH-220	C Cap	
C430	" -270	"	
C431	QET61ER-475	E Cap	
C432	QCT25CH-820	C Cap	
C433	QCF31HP-223	"	
C434	" -223	"	
C435	" -223	"	
C436	QET61HR-105	E Cap	
C437	QET61AR-476	"	
C438	QCF31HP-223	C Cap	
C439	" -103	"	
C440	QCS31HJ-220	"	
C441	—	—	
C442	QCF31HP-103	C Cap	
C443	" -223	"	
C444	" -223	"	
C445	QET61AR-476	E Cap	

Symbol No.	Part No.	Part Name	Description
C446	QCF31HP-103	C Cap	
C447	QET61AR-476	E Cap	
C448	QCF31HP-223	C Cap	
C449	QFN31HK-153	M Cap	
C450	QET61AR-336	E Cap	
C451	QET61CR-106	"	
C452	QFN31HJ-122	M Cap	
C453	" -182	"	
C454	QCF31HP-103	C Cap	
C455	" -103	"	
C456	" -103	"	
C457	" -223	"	
C458	" -103	"	
C459	QCF11HP-223	"	
C501	QET61AR-476	E Cap	
C502	QCF31HP-223	C Cap	
C503	QEN61CM-226	NP Cap	
C504	QET61AR-476	E Cap	
C505	" -476	"	
C506	QET61CR-476	"	
C507	QCF31HP-223	C Cap	
C508	QET60JR-476	E Cap	
C509	" -227	"	
C510	QCF31HP-223	C Cap	
C511	QET61AR-476	E Cap	
C512	" -108	"	
C513	QCF31HP-223	C Cap	
C514	" -223	"	
C515	QET61AR-226	E Cap	
C516	QEN61HM-105	NP Cap	
C517	QFN31HJ-472	M Cap	
C518	" -472	"	
C519	QET61CR-476	E Cap	
⚠ L101	PU48530-101K	Coil	
L102	" -330J	"	
L103	" -391J	"	
L104	" -121J	"	
L105	" -101J	"	
⚠ L106	" -101K	"	
⚠ L107	" -101K	"	
⚠ L108	" -101K	"	
L109	" -180J	"	
L110	" -220J	"	
⚠ L111	" -101K	"	
L112	" -330J	"	
L113	" -150J	"	
L114	" -470J	"	
L115	" -151J	"	
L116	" -150J	"	
L117	" -680J	"	
⚠ L118	" -101K	"	
L119	" -330J	"	
⚠ L120	" -101K	"	
L121	" -330J	"	
L122	" -180J	"	
L123	" -180J	"	
⚠ L124	" -101K	"	
L125	" -6R8J	"	
L126	" -680J	"	
L127	" -181J	"	
⚠ L128	" -101K	"	
⚠ L129	" -101K	"	

Symbol No.	Part No.	Part Name	Description
L130	PU48530-180J	Coil	
L131	" -390J	"	
⚠ L132	" -101K	"	
⚠ L133	" -101K	"	
⚠ L401	PU48530-101K	Coil	
L402	PU47051-822	"	
⚠ L403	PU48530-101K	"	
⚠ L404	" -101K	"	
L405	" -150J	"	
L406	" -271J	"	
⚠ L407	" -101K	"	
L408	–	–	
⚠ L409	PU48530-101K	Coil	
L410	PU49057	"	
L411	PU47051-562	"	
⚠ L501	PU48530-101K	Coil	
⚠ L502	" -101K	"	
L503	" -6R8K	"	
⚠ L504	" -101K	"	
LPF101	PU53348	Low Pass Filter	
LPF102	"	"	
LPF401	PU54988	Low Pass Filter	
LPF402	PU54408-2	"	
BPF401	PU49996-3	Band Pass Filter	
BPF402	PU49465	"	
CF401	PU46521	Ceramic Filter	
CF501	PU51190	Ceramic Filter	
EQ101	PU53349	Equalizer	
EQ102	"	"	
EQ103	PU54400-2	"	
EQ401	PU48515-7	Equalizer	
EQ501	PU54958	Equalizer	
DL101	PU53331-2	1H Delay Line	
DL401	PU55253	2H Comb Filter	
⚠ X401	PU31449-4	Crystal	
⚠ XB401	PU54872M	Crystal Block	or PU54872
CN1	PU43351-12	Cap Housing	
CN2	" -3	"	
CN3	" -6	"	
CN4	" -2	"	
CN5	" -2	"	
CN6	PU51945-08	"	
	PU55237	Pre Amp Shield (1)	
	PU55238	" (2)	
	PU55239	" (3)	
⚠	PU55089M	RF Converter Ass'y	
	PQ30071	Holder	

Symbol No.	Part No.	Part Name	Description
	DPSP2606Z	Screw	
	PQ40378	Spacer	
	PU43192-4	Binder	
	PU55379	Mini Clamp	
	PU52105	Plastic Rivet	
	PU50766	Test Point	TP GND1 ~ 3, 103,106, 122 ~ 126, 403,404 406,410 411,412 421 ~ 423,510

6.2.4 Audio Servo Mechacon Board Ass'y

[0][4] PU10703-K-M

Symbol No.	Part No.	Part Name	Description
(Audio Section)			
IC1	LA7042	Integrated Circuit	
Q1	2SD958S,T,U	Transistor	
Q2	〃	〃	
Q3	2SB788S,T,U	〃	
Q4	2SD636R,S	〃	
⚠ Q5	〃	〃	
⚠ Q6	2SB641R,S	〃	
⚠ Q7	〃	〃	
⚠ Q8	2SD638R,S	〃	
D1	RD4.7EB	Zener Diode	
D2	MA150	Diode	or 1S2473, 1SS133
D3	〃	〃	〃
D4	〃	〃	
D5	〃	〃	
R1	QRD181J-472	CR	
R2	〃 -222	〃	
R3	〃 -562	〃	
R4	〃 -103	〃	
R5	〃 -473	〃	
R6	QVZ1802-151	VR	PB Level
R7	QRD181J-560	CR	
R8	〃 -124	〃	
R9	〃 -103	〃	
R10	〃 -102	〃	
R11	〃 -183	〃	
R12	〃 -153	〃	
R13	〃 -563	〃	
R14	〃 -221	〃	
R15	〃 -562	〃	
R16	〃 -103	〃	
R17	〃 -273	〃	
R18	QVZ1802-103	VR	Rec Level
R19	QRD181J-101	CR	
R20	〃 -225	〃	
R21	〃 -333	〃	
R22	〃 -152	〃	
R23	〃 -122	〃	
R24	〃 -222	〃	
R25	〃 -104	〃	
⚠ R26	〃 -562	〃	
R27	〃 -103	〃	
R28	〃 -104	〃	
R29	〃 -223	〃	
R30	QVZ1802-105	VR	Bias Current
⚠ R31	QRD181J-100	CR	
R32	〃 -123	〃	
R33	〃 -3R3	〃	
R34	〃 -563	〃	
R35	〃 -682	〃	
R36	〃 -103	〃	
R37	QRD161J-103	〃	
R38	〃 -103	〃	
C1	QEB61CM-106	E Cap	
C2	〃 -226	〃	
C3	QFN31HJ-123	M Cap	
C4	QET61EM-475	E Cap	
C5	QET61HM-105	〃	
C6	QFN31HJ-472	M Cap	
C7	〃 -153	〃	
C8	〃 -103	〃	
C9	QET61AM-107	E Cap	
C10	QFN31HJ-222	M Cap	
C11	QET61HM-105	E Cap	
C12	QET61EM-475	〃	
C13	QFN31HK-152	M Cap	
C14	QET61CM-106	E Cap	
C15	QET61EM-475	〃	
C16	QFN31HJ-183	M Cap	
C17	QET61EM-475	E Cap	
C18	QET61AM-476	〃	
C19	QET61HM-474	〃	
C20	QET61EM-475	〃	
C21	QET61AM-107	〃	
C22	〃 -476	〃	
C23	QCS31HJ-271	C Cap	
C24	〃 -561	〃	
C25	QFP32AJ-473	PP Cap	
C26	QET61AM-476	E Cap	
C27	QFN31HJ-152	M Cap	
C28	〃 -682	〃	
C29	QCS31HJ-561	C Cap	
C30	QFN31HJ-153	M Cap	
C31	QCS31HJ-561	C Cap	
C32	QEK41CM-106	E Cap	
L1	PU54710-562	Coil	
L2	〃 -682	〃	
L3	〃 -103	〃	
L4	〃 -183	〃	
L5	PU53618-561JD	〃	
CN1	PU43351-3	Cap Hcusing	
CN2	〃 -6	〃	
CN3	〃 -2	〃	
CN4	〃 -4	〃	
⚠ T1	PU55296-2	OSC Trans.	
S1	PU55243	Slide Switch	
(Servo Section)			
IC401	BA6302A	Integrated Circuit	
IC402	BA6305	〃	
⚠ IC403	HA11751NT	〃	
IC404	BA6328	〃	
IC405	MB84066B	〃	
IC406	UPC324C	〃	
⚠ IC407	HA13008	〃	
IC408	BA6305		
Q401	DTA144W,F	Transistor	
Q402	2SB641R,S	〃	
Q403	DTA144W,F	〃	
Q404	—	—	

Symbol No.	Part No.	Part Name	Description
Q405	2SD636RS	Transistor	
⚠ Q406	2SD638R,S	"	
Q407	2SB641R,S	"	
Q408	2SD636R,S	"	
Q409	DTC144W,F	"	
Q410	"	"	
Q411	"	"	
Q412	"	"	
Q413	"	"	
Q414	DTA144W,F	"	
Q415	–	–	
Q416	2SD636R,S	Transistor	
Q417	DTC144W,F	"	
Q418	"	"	
Q419	"	"	
Q420	"	"	
Q421	2SB641R,S	"	
Q422	2SD636R,S	"	
Q423	2SB641R,S	"	
Q601	DTA144W,F	Transistor	
D401	MA150	Diode	or 1SS133, 1S2473
D402	"	"	"
D403	RD5.6EB2	Zener Diode	
D404	DA203	Diode Array	
D405	1SS133	Diode	
D406	"	"	
D407	"	"	
D408	DA203	Diode Array	
D409	1SS133	Diode	
D410	–	–	
D411	DA203	Diode Array	
D412	RD12EB	Zener Diode	
D413	MA150	Diode	
D414	"	"	
D415	"	"	
D416	"	"	
D417	1SS133	"	
D418	"	"	
D601	DA203	Diode Array	
D602	DAP201	"	
D603	"	"	
R401	QRD161J-223	CR	
R402	QRD181J-103	"	
R403	QVZ3511-473	VR	Cap. Discri
R404	QRD161J-683	CR	
R405	" -103	"	
R406	" -394	"	
R407	" -102	"	
R408	" -103	"	
R409	" -823	"	
R410	" -103	"	
R411	" -103	"	
R412	" -103	"	
R413	" -102	"	
R414	QRD181J-152	"	
R415	QRD161J-331	"	
R416	" -334	"	
R417	" -103	"	

Symbol No.	Part No.	Part Name	Description
R418	QRD161J-103	CR	
R419	" -103	"	
R420	" -102	"	
R421	" -823	"	
R422	" -103	"	
R423	" -103	"	
R424	" -102	"	
R425	" -472	"	
R426	" -103	"	
R427	" -472	"	
R428	" -684	"	
R429	" -224	"	
R430	QRD181J-333	"	
R431	QRD161J-472	"	
R432	" -153	"	
R433	" -333	"	
R434	QRD181J-473	"	
R435	QRD161J-104	"	
R436	" -271	"	
R437	" -271	"	
R438	" -473	CR	
R439	QRD181J-393	"	
R440	PU55222	VR	TRACK VR 250K
R441	QRD161J-472	CR	
R442	" -471	"	
R443	" -682	"	
R444	" -273	"	
R445	" -153	"	
R446	QVZ1802-473	VR	V.P. Position
R447	QRD161J-333	CR	
R448	QVZ3511-104	VR	CH-2 SW Phase
R449	QRD161J-683	CR	
R450	QVZ3511-104	VR	CH-1 SW Phase
R451	QRD161J-393	CR	
R452	" -104	"	
R453	" -472	"	
R454	" -472	"	
R455	QRD181J-473	"	
R456	" -473	"	
R457	" -102	"	
R458	QRD161J-102	"	
R459	QVZ1802-473	VR	Drum PU Pluse Level
R460	QRD181J-562	CR	
R461	QVZ3511-332	VR	H. DISCRI
R462	QRD161J-563	CR	
R463	QVZ3511-223	VR	DRUM DISCRI
R464	QRD181J-103	CR	
R465	–	–	
R466	QRD161J-274	CR	
R467	" -472	"	
R468	" -103	"	
R469	" -474	"	
R470	" -103	"	
R471	" -103	"	
R472	" -103	"	
R473	QRD181J-103	"	
R474	–	–	
R475	QRD181J-103	CR	
R476	QRD161J-103	"	
R477	–	–	
R478	QRD161J-563	CR	
R479	" -472	"	
R480	QRD181J-472	"	
R481	–	–	
R482	–	–	
R483	QRD181J-124	CR	

Symbol No.	Part No.	Part Name	Description
R484	QRD181J-105	CR	
R485	" -154	"	
R486	" -105	"	
R487	" -333	"	
R488	QRD161J-153	"	
R489	QRD181J-124	"	
R490	" -103	"	
R491	QRD161J-273	"	
R492	" -103	"	
R493	" -102	"	
R494	QRD181J-472	"	
R495	" -332	"	
R496	" -472	"	
R497	" -105	"	
R498	" -683	"	
R499	QRD161J-181	"	
R500	QRD181J-105	"	
R501	QRD161J-181	"	
R502	QRD181J-270	"	
R503	QRD161J-270	"	
R504	QRD181J-331	"	
R505	" -331	"	
R506	–	–	
R507	QRD161J-473	CR	
⚠ R508	QRX019J-R68S	MFR	
R509	QRD181J-103	CR	
R510	" -223	"	
R511	" -223	"	
R512	" -473	"	
R600	QRD161J-564	"	
R601	" -104	"	
R602	QRD182J-474	"	
R603	QRD161J-123	"	
R604	" -103	"	
R605	" -104	"	
C401	QCF31HP-102	C Cap	
C402	" -102	"	
C403	" -102	"	
C404	QET61CM-106	E Cap	
C405	" -106	"	
C406	QFN31HK-103	M Cap	
C407	QCY31HK-103	C Cap	
C408	QFP32AJ-153	PP Cap	
C409	–	–	
C410	–	–	
C411	QET61CM-106	E Cap	
C412	QCY31HK-102	C Cap	
C413	" -103	"	
C414	QET61CM-106	E Cap	
C415	" -226	"	
C416	" -476	"	
C417	QCY31HK-102	C Cap	
C418	QET61CM-106	E Cap	
C419	QCY31HK-103	C Cap	
C420	QET61CM-476	E Cap	
C421	" -106	"	
C422	QFN31HK-272	M Cap	
C423	QET61EM-475	E Cap	
C424	" -106	"	
C425	QCY31HK-103	C Cap	
C426	QET61CM-106	E Cap	

Symbol No.	Part No.	Part Name	Description
C427	QET41CM-106	E Cap	
C428	QEK61CM-476	"	
C429	QEB41EM-475	"	
C430	QFN31HJ-272	M Cap	
C431	" -392	"	
C432	" -272	"	
C433	" -102	"	
C434	QFN31HK-473	"	
C435	QCY31HK-331	C Cap	
C436	QFN31HK-473	M Cap	
C437	QCF31HP-223	C Cap	
C438	QFN31HJ-154	M Cap	
C439	QCY31HK-102	C Cap	
C440	QCS31HK-120	"	
C441	QCY31HK-103	"	
C442	QFN31HJ-103	M Cap	
C443	" -103	"	
C444	" -103	"	
C445	QET61HM-105	E Cap	
C446	QFN31HJ-223	M Cap	
C447	" -223	"	
C448	QCY31HK-331	C Cap	
C449	QFN31HK-223	M Cap	
C450	" -223	"	
C451	QET61CM-476	E Cap	
C452	QEN61CM-106	NP Cap	
C453	QCY31HK-103	C Cap	
C454	QFN31HK-473	M Cap	
C455	" -473	"	
C456	QCF31HP-102	C Cap	
C457	–	–	
C458	QET61CM-106	E Cap	
C459	QFP42AJ-682	PP Cap	
C460	" -472M	"	
C461	–	–	
C462	QCY31HK-103	C Cap	
C463	QFN31HK-333	M Cap	
C464	QET61CM-106	E Cap	
C465	QCS31HK-101	C Cap	
C466	QCY31HK-103	"	
C467	QEN61CM-106	NP Cap	
C468	–	–	
C469	QET61CM-106	E Cap	
C470	QFN31HK-333	M Cap	
C471	QCY31HK-103	C Cap	
C472	QFN31HK-104	M Cap	
C473	QEB61EM-475	E Cap	
C474	QET61HM-225	"	
C475	QEN61EM-475	NP Cap	
C476	QEN41EM-475	"	
C477	–	–	
C478	QFN41HK-104	M Cap	
C479	QCY31HK-103	C Cap	
C480	–	–	
C481	QEN61CM-106	NP Cap	
C601	QET61CM-106	E Cap	
⚠ TH401	PU52108-2R2	Posistor	
⚠ X401	PU31449-4	Crystal	

Symbol No.	Part No.	Part Name	Description
CN11	PU43351-2	Cap Housing	
CN12	" -2	"	
CN13	" -2Y	"	
CN14	" -8	"	
CN15	" -2R	"	
CN16	" -6	"	
	PU55774	Test Point	TP401~403, 406,407,409 412,421~423, 425 GND
(M CTL Section)			
⚠ IC201	M50740-602SP	Integrated Circuit	
IC202	M50790SP	"	
IC203	M51015L	"	
IC204	M54544L	"	
IC205	"	"	
IC206	"	"	
IC207	BX6050	"	
Q201	–	–	
Q202	DTC124F	Transistor	
Q203	2SD1227M,R	"	
Q204	2SD1055Q,R	"	
⚠ Q205	2SD639R,S	"	
Q206	2SD637R,S	"	
⚠ Q207	2SD313EF-LU	"	
Q208	2SB642Q,R,S	"	
Q209	DTC144F	"	or DTC144W,F
Q210	DTA144F	"	or DTA144W,F
Q211	"	"	"
Q212	DTC144F	"	or DTC144W,F
Q213	–	–	
Q214	–	–	
Q215	–	–	
Q216	–	–	
Q217	2SC828Q,R,S	Transistor	
Q218	DTA144F	"	or DTA144W,F
Q219	DTA144W,F	"	
D201	MA150	Diode	or 1SS133, 1S2473
D202	PD48PI	Photo Diode	
D203	RD5.1EB1	Zener Diode	
D204	MA150	Diode	or 1SS133, 1S2473
⚠ D205	HZ6A3L	Zener Diode	or RD5.6EB2
D206	0A90	Diode	
D207	1SS133	"	
D208	"	"	
D209	"	"	
D210	MA150	"	
D211	"	"	
D212	0A91	"	
D213	–	–	
D214	–	–	
D215	–	–	
D216	–	–	
D217	–	–	
D218	–	–	
D219	–	–	

Symbol No.	Part No.	Part Name	Description
D220	1SS133	Diode	
D221	MA150	"	or 1SS133, 1S2473
D222	"	"	"
D223	1SS133	"	
D224	DAN-201	Diode Array	or MC921-28
D225	"	"	"
D226	–	–	
D227	–	–	
D228	–	–	
D229	1SS133	Diode	or MA150, 1S2473
D230	–	–	
D231	1SS133	Diode	
RA201	EXB-P87223M	Resistor Array	or FRE7223M
RA202	EXB-P84472M	"	or FRE4472M
RA203	–	–	
RA204	EXB-P84223M	Resistor Array	or FRE4223M
RA205	EXB-P84104M	"	or FRE4104M
R201	QRD181J-102	CR	
R202	QRD161J-103	"	
R203	" -103	"	
R204	" -104	"	
R205	QRD181J-273	"	
R206	–	–	
R207	QRD161J-272	CR	
R208	" -272	"	
R209	" -152	"	
R210	" -472	"	
R211	" -472	"	
R212	" -472	"	
R213	" -472	"	
R214	" -182	"	
R215	QRD181J-333	"	
R216	" -333	"	
R217	" -333	"	
R218	QRD161J-333	"	
R219	–	–	
R220	–	–	
R221	QRD161J-472	CR	
R222	" -472	"	
R223	" -472	"	
R224	" -472	"	
R225	" -102	"	
R226	" -102	"	
R227	" -223	"	
R228	–	–	
R229	QRD181J-103	CR	
R230	–	–	
R231	QRD161J-105	CR	
R232	QRD181J-332	"	
R233	" -223	"	
R234	" -333	"	
R235	" -103	"	
R236	" -333	"	
R237	" -223	"	
R238	" -333	"	
R239	QRD161J-333	"	
R240	" -821	"	
R241	QRD181J-102	"	

Symbol No.	Part No.	Part Name	Description
R242	QRD161J-682	CR	
R243	QRD181J-102	"	
R244	QRD161J-682	"	
R245	QRD181J-472	"	
R246	" -333	"	
R247	" -333	"	
R248	" -333	"	
R249	" -333	"	
R250	" -333	"	
R251	" -333	"	
R252	QRD161J-333	"	
R253	" -333	"	
R254	QRD181J-124	"	
R255	" -124	"	
R256	" -123	"	
R257	QRD161J-472	"	
R258	" -103	"	
R259	—	—	
R260	QRD161J-223	CR	
R261	" -223	"	
R262	QRD181J-203	"	
R263	" -203	"	
R264	" -103	"	
R265	" -203	"	
R266	" -103	"	
R267	" -203	"	
R268	" -103	"	
R269	" -203	"	
R270	" -153	"	
R271	QVZ1802-223	VR	Still Noise
R272	QRD161J-103	CR	
R273	" -223	"	
R274	QRD181J-472	"	
R275	PU55350	VR	Picture Sharpness
R276	QRD181J-333	CR	
R277	QRD161J-103	"	
R278	" -103	"	
R279	QRD121J-331	"	
R280	QRD181J-101	"	
R281	" -223	"	
R282	" -472	"	
R283	" -333	"	
R284	" -122	"	
R285	" -103	"	
R286	QRD161J-181	"	
R287	" -104	"	
R288	" -103	"	
R289	" -682	"	
R290	" -683	"	
R291	" -472	"	
C201	QET61CM-106	E Cap	
C202	QCS31HJ-681	C Cap	
C203	" -121	"	
C204	QET61HM-105	E Cap	
C205	QFN31HK-472	M Cap	
C206	" -104	"	
C207	QET61AM-226	E Cap	
C208	" -226	"	
C209	QFN31HK-332	M Cap	
C210	" -152	"	
C211	" -152	"	
C212	" -472	"	
C213	" -103	"	

Symbol No.	Part No.	Part Name	Description
C214	QFN31HK-103	M Cap	
C215	QCF11EZ-104	C Cap	
C216	QFN31HK-104	M Cap	
C217	QCS31HJ-390	C Cap	
C218	" -390	"	
C219	QET61CM-106	E Cap	
C220	QFN31HK-104	M Cap	
C221	" -472	"	
C222	" -223	"	
C223	QET61AM-226	E Cap	
C224	QFN31HK-104	M Cap	
C225	" -104	"	
C226	" -223	"	
C227	" -223	"	
C228	" -223	"	
C229	" -223	"	
C230	QET61EM-226	E Cap	
C231	—	—	
C232	QEN61HM-105	NP Cap	
C233	—	—	
C234	QET61AM-226	E Cap	
⚠ L201	PU53618-101JD	Coil	
⚠ L202	" -101JD	"	
⚠ CP1	ICP-F15	Protector	
TH202	ERT-D2FHK432S	Thermistor	
CF201	PU55407	Ceramic Filter	2 MHz
CN21	PU43351-8	Cap Housing	
CN22	" -9	"	
CN23	" -4	"	
CN24	" -3R	"	
CN25	" -3	"	
CN26	" -2	"	
CN27	" -9	"	
CN28	" -2	"	
CN29	—	—	
CN30	PU43351-12	Cap Housing	
CN31	" -2R	"	
CN32	" -2Y	"	
	PU55446	Shield Case	
	PU55447	Shield Cover	
	PU55448	Shield Plate	
⚠	PU55648	Heat Sink	for Q207
	PU45375	Spacer	for Heat Sink
	PU41624-6	Insulator	"
	SPSP3006Z	Screw	"
	SDSA3010Z	Tap Screw	
	PQ30120A	Switch Holder Ass'y	
	PU52939-2	Clamp	
	PU43192-4	Binder	
	PU52105	Plastic Rivet	
	Q03095-206	Washer	
	PU56011	Stopper	

6.2.5 Operation Board Ass'y [0][6] PU21711A-1-M

Symbol No.	Part No.	Part Name	Description
IC1	M50115AP	Integrated Circuit	
⚠ D1	HZ6C1L	Diode	or HZ6C
D2	GL-3HD5	LED	
D3	–	–	
D4	GL-3HD5	LED	
D5	〃	〃	
D6	〃	〃	
D7	〃	〃	
D8	〃	〃	
⚠ R1	QRD181J-102	CR	
R2	〃 -821	〃	
R3	〃 -821	〃	
R4	〃 -821	〃	
R5	〃 -821	〃	
R6	〃 -821	〃	
R7	〃 -821	〃	
R8	〃 -821	〃	
C1	QCS31HJ-221	C Cap	
C2	〃 -221	〃	
S1	PU52621	Push Switch	
S2	〃	〃	
S3	PU53598	Tact Switch	
S4	〃	〃	
S5	〃	〃	
S6	〃	〃	
S7	〃	〃	
S8	〃	〃	
S9	〃	〃	
CF1	PU49487-2	Ceramic Filter	
CN1	PU43351-111	Cap Housing	(2~12)
	PQ40201	LED Spacer	for D2,D4~D8

6.2.6 Tuner/IF Board Ass'y [0][7] PU21667D

Symbol No.	Part No.	Part Name	Description
⚠ IC1	M51316P	Integrated Circuit	
Q1	2SC2636S,T	Transistor	
Q2	–	–	
Q3	2SB641P,Q,R	Transistor	
Q4	2SD637P,Q,R	〃	
Q5	DTC114F	〃	
Q6	DTC144F	〃	
⚠ Q7	2SB598E,F	〃	
Q8	2SB644P,Q,R	〃	
Q9	2SD637P,Q,R	〃	
Q10	–	–	
Q11	DTC144F	Transistor	
Q12	2SD637P,Q,R	〃	
Q13	2SB641P,Q,R	〃	
D1	RD6.8EB2	Zener Diode	
D2	MA150	Diode	
D3	〃	〃	
D4	〃	〃	
D5	LTZ-R15	〃	
D6	MA150	〃	
D7	〃	〃	
D8	〃	〃	
D9	–	–	
⚠ D10	HZT33-02	Zener Diode	
R1	QRD181J-750	CR	
R2	〃 -103	〃	
R3	〃 -152	〃	
R4	〃 -681	〃	
R5	〃 -101	〃	
R6	〃 -150	〃	
R7	〃 -331	〃	
R8	〃 -102	〃	
R9	〃 -222	〃	
R10	〃 -472	〃	
R11	QVZ1802-472	VR	AGC
R12	QRD181J-102	CR	
R13	–	–	
R14	QRD181J-153	CR	
⚠ R15	QRZ0054-100	Fusible R	
R16	QRD181J-471	CR	
R17	〃 -473	〃	
R18	〃 -471	〃	
R19	〃 -471	〃	
R20	–	–	
R21	QRD181J-331	CR	
R22	〃 -101	〃	
R23	〃 -332	〃	
R24	〃 -102	〃	
R25	〃 -331	〃	
R26	–	–	
R27	QRD181J-104	CR	
R28	〃 -474	〃	
R29	〃 -470	〃	
R30	QRD161J-472	〃	
R31	QRD181J-102	〃	
R32	〃 -223	〃	
R33	〃 -273	〃	
R34	〃 -222	〃	
R35	〃 -122	〃	

Symbol No.	Part No.	Part Name	Description
R36	QRD181J-682	CR	
R37	" -104	"	
R38	" -822	"	
R39	QVZ1802-332	VR	Color Level
R40	QRD161J-472	CR	
R41	QRD181J-332	"	
R42	" -471	"	
R43	" -151	"	
R44	QVZ1802-103	VR	Audio Level
R45	QRD181J-103	CR	
⚠ R46	" -472	"	
R47	" -473	"	
R48	" -151	"	
R49	–	–	
R50	–	–	
R51	QRD181J-103	CR	
R52	" -474	"	
R53	" -333	"	
R54	" -332	"	
R55	" -151	"	
R56	" -103	"	
R57	–	–	
R58	QRD181J-124	CR	
R59	" -104	"	
R60	" -334	"	
R61	" -104	"	
R62	" -104	"	
R63	" -104	"	
R64	" -104	"	
R65	" -104	"	
R66	" -104	"	
R67	" -104	"	
R68	" -104	"	
R69	" -103	"	
R70	–	–	
R71	QRD181J-104	CR	
R72	" -103	"	
C1	QCF31HP-102	C Cap	
C2	" -102	"	
C3	" -222	"	
C4	" -222	"	
C5	QET61CM-106	E Cap	
C6	QET61EM-475	"	
C7	QFN31HK-473	M Cap	
C8	QET61CM-106	E Cap	
C9	QCF31HP-222	C Cap	
C10	–	–	
C11	QFN31HK-473	M Cap	
C12	QCF31HP-222	C Cap	
C13	" -222	"	
C14	" -222	"	
C15	" -222	"	
C16	QET61CM-336	E Cap	
C17	QCS31HJ-470	C Cap	
C18	QCF31HP-223	"	
C19	QFN31HK-222	M Cap	
C20	QET61CM-106	E Cap	
C21	QET61HM-105	"	
C22	QCT25CH-6R0	C Cap	
C23	QCT25HH-680	"	
C24	QCF31HP-102	"	
C25	QCT25LH-560	"	
C26	QCF31HP-222	"	

Symbol No.	Part No.	Part Name	Description
C27	QCT25CH-100	C Cap	
C28	QFN31HK-102	M Cap	
C29	QCF31HP-222	C Cap	
C30	–	–	
C31	QET61HM-105	E Cap	
C32	QET61CM-336	"	
C33	" -106	"	
C34	QCS31HJ-180	C Cap	
C35	" -270	"	
C36	QCF31HP-102	"	
C37	–	–	
C38	QET60JM-476	E Cap	
C39	QCS31HJ-101	C Cap	
C40	–	–	
C41	QET61HM-106	E Cap	
C42	QCF31HP-223	C Cap	
C43	" -223	"	
C44	QET61HM-105	E Cap	
C45	" -105	"	
C46	QCF31HP-103	C Cap	
C47	" -103	"	
C48	QFN31HK-104	M Cap	
C49	–	–	
C50	QET61CM-106	E Cap	
C51	–	–	
C52	QET61HM-474	E Cap	
C53	QFN31HK-104	M Cap	
C54	–	–	
C55	–	–	
C56	–	–	
C57	–	–	
C58	–	–	
C59	–	–	
C60	–	–	
C61	QET61CM-107	E Cap	
C62	" -106	"	
C63	" -106	"	
C64	" -106	"	
L1	PU53606-1R0	Peaking Coil	
L2	PU49994-6R8	"	
L3	" -100	"	
L4	" -150	"	
L5	" -470	"	
SW1	PU34218	Saw Filter	
CF1	PU55270	Ceramic Filter	
CF2	PU49295	"	
CF3	PU32990-2	"	
T1	PU32988-3	I.F.T	
T2	PU55267	"	
T3	PU32177-3	"	
T4	PU55268	"	
T5	PU51467	"	
CN1	PU43351-10	Cap Housing	
CN2	" -2	"	
CN3	" -2	"	

Symbol No.	Part No.	Part Name	Description
CN4	PU43351-3	Cap Housing	
CN5	–	–	
CN6	PU43351-2Y	Cap Housing	
	PU34223	Shield Case (1)	
	PU34224	Shield Cover (1)	
	PU34225	Shield Plate (1)	
	PU34226	Shield Case (2)	
	PU34227	Shield Cover (2)	
	PU34228	Shield Plate (2)	
⚠	PU34219	Tuner	
	PU51721	Test Pin	TP1 ~ 4

6.2.7 Timer/Pre-Setter and T/T Sub Boards Ass'y

[0][8] ..... **PU21664C (E)**
PU21664A (EG)

Symbol No.	Part No.	Part Name	Description
⚠ IC1	UPD7538C-011	Integrated Circuit	
IC2	TL066CP	"	or UPC802C
Q1	DTC144W,F	Transistor	
⚠ Q2	2SD638R,S	"	
Q3	2SD1211R	"	
Q4	DTC124F	"	
Q5	DTA114F	"	
Q6	2SA937Q,R	"	
Q7	2SD637P,Q,R,S	"	or 2SC828P,Q,R 2SC828A,P,Q,R
Q8	DTA114F	"	
Q9	"	"	
Q10	"	"	
D1	–	–	
D2	MA161	Diode	
D3	–	–	
D4	–	–	
D5	SLR-34MC12F	LED	
D6	HZ5C-2	Zener Diode	
D7	–	–	
⚠ D8	RD4.3EB	Zener Diode	
D9	LTZ-R15	Diode	
D10	1SS133	"	
D11	–	–	
D12	–	–	
D13	SLR-54MT4	LED	or LN31GCPH-5
D14	"	"	"
D15	"	"	"
D16	"	"	"
D17	"	"	"
D18	"	"	"
D19	"	"	"
D20	"	"	"
D21	–	–	
D22	–	–	
D23	–	–	
⚠ D24	RD4.7EB2	Zener Diode	
D25	–	–	
D26	MA150	Diode	
D27	"	"	
D28	"	"	
D29	"	"	
D30	"	"	
D31	"	"	
D32	"	"	
D33	"	"	
D34	–	–	
D35	–	–	
D36	–	–	
D37	1SS133	Diode	
D38	–	–	
D39	–	–	
D40	MA150	Diode	
DA1	DAP201	Diode Array	
DA2	DAP401	"	
RA1	EXB-P84333M	Resistor Array	or FRE4333M
RA2	EXB-P85224M	"	or FRE5224M
RA3	EXB-P84103M	"	or FRE4103M

Symbol No.	Part No.	Part Name	Description
R1	—	—	
R2	—	—	
R3	QRD161J-471	CR	
R4	QRD181J-561	"	
R5	—	—	
R6	—	—	
R7	—	—	
R8	QRD161J-103	CR	
R9	QRD181J-472	"	
R10	—	—	
R11	QRD161J-104	CR	
R12	QRD181J-474	"	
R13	" -474	"	
R14	" -394	"	
R15	QRD161J-473	"	
R16	QRD181J-333	"	
R17	—	—	
R18	QRD161J-224	CR	
R19	" -474	"	
R20	—	—	
R21	QRD161J-103	CR	
R22	" -103	"	
R23	" -472	"	
R24	" -472	"	
R25	" -472	"	
R26	" -472	"	
R27	" -472	"	
R28	—	—	
R29	—	—	
R30	QRD161J-221	CR	
R31	—	—	
R32	—	—	
R33	QRD181J-221	CR	
R34	" -221	"	
R35	" -221	"	
R36	" -221	"	
R37	" -221	"	
R38	" -221	"	
R39	" -221	"	
R40	" -221	"	
R41	—	—	
R42	—	—	
R43	—	—	
R44	QRD181J-8R2	CR	
R45	QRD161J-473	"	
R51	QRD181J-474	CR	
R52	QRD161J-104	"	
R53	" -333	"	
R54	" -473	"	
R55	QRD161J-393	"	
R56	" -333	"	
R57	QRD181J-102	"	
C1	—	—	
C2	QET61CM-336	E Cap	
C3	QET61HM-225	"	
C4	QET60JM-228	"	
C5	QCF11HP-223	C Cap	
C6	QET61HM-475	E Cap	
C7	QCS11HJ-101	C Cap	
C8	" -101	"	
C9	QEK41EM-335	E Cap	or QEK41HM-335
C10	QFM31HK-103	M Cap	
C11	" -682	"	

Symbol No.	Part No.	Part Name	Description
C12	QET61VM-107	E Cap	
C13	QFM32AJ-223	M Cap	
C14	QCC41CN-223	C Cap	
C15	QCX11EM-153	"	
C16	—	—	
C17	QCF31HP-223	C Cap	
C18	" -103	"	
C19	QET61HM-106	E Cap	
C20	QET60JM-227	"	
C21	QCC41CN-223	C Cap	
C22	" -223	"	
C23	" -223	"	
L1	PU48530-101K	Peaking Coil	
⚠ T1	PU51531	Heater Trans	
⚠ CF1	PU50224	Ceramic Filter	
CN1	—	—	
CN2	PU43351-4	Cap Housing	
CN3	—	—	
CN4	PU54208-10	Cap Housing	
CN5	PU43351-2	"	
SW1	PU53598	Tact Switch	
SW2	"	"	
SW3	"	"	
SW4	"	"	
SW5	"	"	
SW6	"	"	
SW7	"	"	
SW8	"	"	
SW9	"	"	
SW10	"	"	
SW11	"	"	
SW12	QSS0046-001	AFC Switch	
SW13	PU52621	Push Switch	
	PU55255	"	CH Select
	PU55772	Tuning Block	
	PU55256	FDP	(E)
	PU55773	"	(EG)
	PQ40181A	FDP Holder Ass'y	
	PU55353	Supporter	
	PU55354	Spacer	
	PQ40113	LED Holder	for D5
	PQ40113-2	"	for D13 ~ D20
	PU55379	Mini Clamp	
	PU43192-4	Binder	
	PU45908-2	Test Pin	TP1 ~ 2

6.2.8 Terminal Board Ass'y [1][0] PU34091B

Symbol No.	Part No.	Part Name	Description
R1	QRD187J-750	CR	
R2	" -681	"	
R3	" -122	"	
R4	" -122	"	
	PU55245	Terminal Ass'y	
CN1	PU51260-6	Cap Housing	

6.2.9 RF SW Board Ass'y [1][1] PU21667A2

Symbol No.	Part No.	Part Name	Description
⚠	PU55092-1-2	Mix Booster	

6.2.10 Mechacon Sub Board Ass'y [2][0] .. PU34544A

Symbol No.	Part No.	Part Name	Description
IC1	TC4011BP	Integrated Circuit	or UPD4011BC
Q1	DTC144F	Transistor	or DTC144WF
D1	MA150	Diode	or 1SS133, 1S2473
D2	"	"	"
D3	"	"	"
D4	"	"	"
D5	"	"	"
D6	"	"	"
R1	QRD182J-333	CR	
R2	" -333	"	
R3	" -333	"	
R4	" -333	"	
R5	" -333	"	
R6	" -223	"	
R7	" -222	"	
R8	" -392	"	
R9	" -392	"	
C1	QET61CM-106	E Cap	
C2	QFN31HJ-104	M Cap	
CN1	PU43351-10	Cap Housing	

6.2.11 Remote Control Board Ass'y PU34245-001

Symbol No.	Part No.	Part Name	Description
⚠ IC1	M50115AP	Integrated Circuit	
⚠ Q1	2SD636Q,R	Transistor	
⚠ Q2	2SB822R	"	
⚠ D1	SE303A	LED	or LN66
⚠ D2	"	"	"
⚠ D3	LN230RPP	"	
⚠ R1	QRD161J-470	CR	
⚠ R2	" -222	"	
⚠ R3	" -471	"	
⚠ R4	" -180	"	
⚠ R5	" -1R2	"	
⚠ R6	" -1R2	"	
⚠ C1	QCS31HJ-101	C Cap	
⚠ C2	" -101	"	
⚠ C3	QEK40JK-101	E Cap	
⚠ CF1	CSB455EI	Ceramic Filter	
⚠	PU34245-004	Electrode Plate	

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